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Including the Railroad Gazette and the Railway Age

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THE Public Utility Commissioners of New Jersey have made a vigorous report on the proposed full-crew law of that state, and on another page we give the substance of their views. This is the first thorough and lucid discussion of the subject that has come from any public authority, so far as we have observed, and it merits the attention of legislators and commissioners of other states—for the advocates of full-crew laws seem to have determined to present their measure to all of the legislatures. The Supreme Court of the United States has decided that any legislature may regulate the size of train crews if it see fit to do so; and it cannot be expected that the court will admonish legislatures to avoid stultifying themselves, at the request of the trainmen's brotherhood, by enacting laws with their eyes shut. An appeal to reason, therefore, is the only practicable measure. The New Jersey commissioners show most forcibly that reason is all against these laws. Such argument as the brakemen might adduce seems to have been overlooked. That an additional man might be useful, on a 60-car train, as a watchman to detect hot journals, or as a transmitter of hand signals, or as a policeman to eject tramps, would be at least a plausible argument; but while admitting that much, it would be necessary still to admit that the cost would be exorbitant, as compared with the value of the advantages. The commissioners, very naturally, turn first to that feature of the bill which does present some show of reason, the need of more men on local passenger trains; but they refer only incidentally to the fact that this need can be met by the employment of porters, willing to give efficient service at moderate wages, almost as well as by members of the trainmen's brotherhood, who demand and receive high pay. Indeed, there are many porters who afford the necessary assistance to passengers better than the same functions are performed by some brakemen. This phase of the question illustrates the difficulty of regulating this matter by specific statute; for the question whether a certain train needs a brakeman or a flagman or a porter, or a part of each kind of service, needs to be decided in each case by a competent railway man who is acquainted with the facts of that particular case. This illuminating report affords evidence that the New Jersey commission is composed of independent men, for the governor of that state, Woodrow Wilson, made a statement in his annual message to the legislature which indicated that he had accepted the claims of the trainmen concerning the need of a full-crew law.

THE Interstate Commerce Commission, in compliance with the demands of shippers and a number of state railway commissions, has suspended for 120 days the new issue of the Western Classification, No. 51, which embodies the recommendations of the Uniform Classification Committee. The *Railway Age Gazette* pointed out last week that the attempt of the railways to bring about uniformity of classification was begun only after repeated insistence by the Interstate Commerce Commission and shippers' organizations, and that the protests against allowing the results of their agitation to be put to a practical test seemed far from consistent with their former accusations of dilatoriness on the part of the railways. The commission, however, has doubtless acted wisely in suspending the classification until a complete investigation can be made by it of the new provisions, and all interests affected can be given a full hearing. As the railway traffic officials argued before undertaking the heavy task of unification, the commercial conditions that have developed under the existing classifications must necessarily be substantially altered by the proposed wholesale readjustment, and probably some interests, particularly those that have profited by former discriminations, will be adversely affected. Even the progress thus far made in the direction of a unification of rules, descriptions and carload minimums represents three years of work by the railway

committee, and perhaps a greater length of time than has been available since its results were made public should be allowed for their study and assimilation. Moreover, a full hearing will lead to a better general understanding of the scope and probable effect of the classification changes, as well as of the intentions of their framers, and by throwing light on the complex conditions that must be taken into consideration may have an important influence on the attitude of the shippers and the commission toward the even more difficult task of revising the actual ratings, which still confronts the classification committees, if the demand for a true uniform classification is to be complied with. Many shippers may object to the postponement of reductions which they have long sought, and which they would gain if the new classification should go into effect; and business conditions will not be helped by protracting the uncertainty as to what changes finally are to be made. It would seem, however, that a better understanding is desirable in the present instance; and that such an understanding can be secured only by delay.

ELSEWHERE in this issue is described a plan being worked out by the management of the Frisco on its Western division to increase the importance and efficiency of the station agent by enlarging his authority and responsibility. Through no other officer or employee does the railway come into closer contact with the public as a whole than through the local agent. For most people no more intimate knowledge of the personnel of railway management is possible than the impressions gained through their dealings with him. The idea of the Frisco management is that by making the agent in a broader sense its business representative in his territory, with the duty of and responsibility for correcting or adjusting the many minor conditions that create friction or cause dissatisfaction, the relations between the company and its patrons may be greatly improved, to their mutual benefit. All station agents on the Frisco have been given authority to settle direct small claims for visible loss or damage to freight; and on the Western division they recently have been charged with the duty of soliciting traffic and instructed to exercise their discretion in other respects in dealing with the public. All this is largely for the purpose of cultivating the good will of the public, and, especially, of promoting a better understanding with the small shipper and the occasional traveler whose experiences, thoughts and comments to so large an extent make up that intangible thing known as "public opinion." The interests of the large shippers and the more regular travelers have been able to claim forcibly the attention of the railway managers. The big shipper, especially, has shown himself entirely capable of taking care of himself; or, at least, of getting himself taken care of. If equivalent attention had been given to winning and keeping the favor of the less influential—individually—members of the general public their collective influence might not have been so easily won to the side of those who have had an interest in aligning themselves against the railways. The possibility of replacing a few traveling solicitors and claim adjusters, who at best must deal largely with strangers, with a body of several hundred bright young men with excellent opportunities for cultivating a wide acquaintanceship and keeping in touch with local conditions, is one that should appeal with force to a management that desires to co-operate to the fullest extent with all its patrons in removing the causes of friction between them. The officials of the Frisco also see in the plan another source of possible advantage. If every railway devoted more effort to securing the traffic naturally tributary to its own line, which could be carried the longest distance on its own line, instead of trying to participate in competitive traffic by moving it over an unnatural route subject to numerous transfers, earnings would be as large and operating expenses would be considerably reduced; and it is believed that this will tend to be the effect of the general solicitation of traffic by station agents instead of by special traveling traffic agents.

THE PROTECTION OF MINORITY STCOKHOLDERS.

ALMOST simultaneously there have arisen three questions affecting the rights of minority stockholders in railways and, by a singular coincidence, all three are connected with one corporation, the New York Central. One question has been the relation to that company of the minority stockholders of the Lake Shore, a subject to which we have recently alluded in a brief way. A second question has been raised by the suit against the New York Central by the Rutland minority, charging illegal practices in the past to the detriment of the minority interest, the charges including inequitable routing of business and unjust division of rates. Along with this has gone the Rutland minority's appeal to the New York Public Service Commission to secure to the minority the same price per share as that to be paid by the New Haven to the New York Central for the Rutland control. The third case is the demand before the same commission, of the minority holders of New York, Ontario & Western stock for a continuance of the old 2 per cent. dividend if control of that line passes to the New York Central—in other words, some sort of a guaranty that the minority will not hereafter be frozen out by the majority's depreciating a minority interest and later buying it in, a process of which there have geen a good many examples in our railway history.

By another coincidence, these New York Central cases illustrate the two leading phases of railway experiences in minority stockholding. On the one hand, the effort of a minority to obtain a great payment for its shares, as the price of letting the majority put through a large scheme of consolidation; and, on the other hand, the desire of two other minority bodies to prevent an apprehended freeze-out.

The history of almost any of the larger railway systems has supplied instances of one of these forms of injustice or the other or both. "Strike" and "freeze-out" are bracketed terms which long ago became familiar expressions. But, of the two, the last has had the more common place in railway annals. Majorities have squeezed minorities much more often than a minority has held up a majority. A majority *per se* is stronger. It can better afford to wait. It can easily starve a small controlled line whose business is in its hand. And, in any appeal to the courts, its legal resources are greater. Thus it has naturally come to pass that, except under a guaranteed dividend, the words "minority interest" have indicated a doubtful position. And, in less degree, minority interests in bonds, especially of weak lines, have been open to the same dangers as stocks. Indeed, by defaulting interest and subsequent reorganization, now happily much less common than in earlier times, majority control of the bonded debt of a road has been more effective for wrong than stock control, and farther in its reach, for it has sometimes wiped stock out altogether.

There has, however, been a slow but steady evolution upward. Fundamentally the minority stockholder has been shielded under the "due process of law" deprivation of property clause of the federal constitution. But for years it was, in the case of a weak minority, a theory of protection rather than a protection itself. In the case of a very few poor minority stockholders, or of a single poor stockholder unable to afford the expense of an appeal to the courts, it was no protection at all. The tendency of legislation in the states has, however, of late years much relieved the situation. It has followed the line of eminent domain, on the one hand, and the property clause of the federal constitution, on the other. A small minority must not be allowed to block an extensive scheme of railway improvement, or of refinancing, both likely to be in the public interest; and, therefore, especially if the public interest is clear, a strong controlling majority may condemn the few minority shares. But the property right of such a minority has been recognized by placing it under appraisal by a body, usually of three, in which both parties have representatives. There has thus, in most cases, been a short cut to the equities across the slow and costly litigation of the courts. Moreover, the appeals of the minorities to the New

York commission, which have had their precedents in other states, indicate yet another development in the direction of guarding minority interests in public service corporations. If it proves effective, it may partly compensate for some enlarged public service commission powers the usefulness of which is not so clear.

But for the real protection of railway minorities, as well as majorities, there is coming into play a force stronger than the courts or public service commissions. Full and accurate publicity is a restraint on corporation evils upon which there is general agreement, and which has had the emphatic approval of so authoritative and eminent a body as the Hadley commission. It is well to mention, however, that that same commission recommended specifically that a purchaser of the majority stock be compelled by law to buy the minority stock, and that a law be passed to give the majority right of eminent domain in cases of an attempted hold up. It has been the lack of publicity that has screened many wrongs of corporate minorities and, in less degree the "strikes" aimed at the controlling interests and not confined to state-house lobbies. Things could be done covertly a few years ago that would be impossible now. And public, as well as official, knowledge of facts concerning minority and majority equities will go far to restrict the evils which yet remain.

THE LEHIGH VALLEY RAIL.

A GREAT deal of discussion has been aroused by the Manchester wreck last July on the Lehigh Valley, which was caused by a broken rail. An elaborate report based on an extensive examination of this rail has been submitted to the Interstate Commerce Commission by James E. Howard of the United States Bureau of Standards; and an abstract of it appears in this issue.

Aside from the fact that it gave rise to a serious wreck, the great amount of attention given to this rail, as compared with that given to the hundreds of other rails which have broken recently, does not appear to be warranted. Mr. Howard reaches the very broad conclusion that "current railway practice in the use of hard steels and high wheel pressures has nearly or quite reached the limit of endurance of the metal of the roadway." The tendency in railway practice has been continually to increase wheel loads as the size of locomotives has been increased to handle heavier trains. Few railway men believe that the limit of this development has been reached, and if it should be found that the present rails will not withstand these heavy wheel loads, then some changes in the rails which will enable them to withstand these loads will become necessary. Mr. Howard's conclusions appear very general, in view of the fact that but one rail was under investigation, and this a rail which was defective as made and of a section which is being gradually discarded. General conclusions on which are based recommendations of as radical changes as are made in this report should be based on a large number of observations on the best material in common use. Such was not the case in this instance. The hundreds of other failed rails which have been studied from time to time by prominent engineers and metallurgists have not shown this alarming defect, but have rather shown that the large majority of failures is due to defects resulting from mill practice. The best published examples are given in the reports of the Rail committee of the American Railway Engineering Association for 1910 and 1911.

The effect of Mr. Howard's whole report is to throw the entire responsibility of rail fractures on the current railway specifications for open hearth rails. Some of the statements tending toward this view are as follows:

"The mills are making the steel which they are required to make under the specification given them.

"Current railway practice in the use of hard steel rails and high wheel pressures has nearly or quite reached the limit of endurance of the metal.

"The formation and development of internal fissures is due to the use of hard steel and high wheel pressures.

"The primary cause of the Manchester wreck was the formation of transverse fissures and longitudinal seams in the head of the rail, aided by defective metal in the web, which resulted in fracture."

If the theory of the development of internal fissures by excessive wheel pressure is correct it should be speedily demonstrated to be so beyond a doubt. The evidence, based on an examination of one rail which was manifestly defective in several respects before it left the mill, is not sufficient or of a character to be convincing or conclusive. Exception must first be taken to the broad statement that the mills are making the steel required under the specifications. The difficulties which the railways have encountered in securing the acceptance by the mills of specifications drawn by them have been discussed recently in these columns. Furthermore the effort to control those conditions which result in defective steel, seams, slag, etc., by specification, frequently fails. The railways are not able to secure the amount of discard necessary to exclude segregation, and pipes which cause seams in the finished rail, and the clause in the specifications which provides that discard shall be such that the sheared ingot shows solid steel is in its practical application entirely perfunctory. Mr. Howard's statement that rails having internal fissures in the head are not the result of mill and converter practice will be questioned by many who have evidence to the contrary, for it is well known that these same defects are often found in softer rails in which the carbon is only 0.40 to 0.60.

Most rails are made according to manufacturers' specifications, and it is difficult or impossible to get the mills to make steel such as the railways desire. They refuse to permit the drop test to be regularly carried to destruction. Such a test would doubtless have revealed the slag seam in the lot of rails which included the one under consideration. It is admitted that slag was rolled into the rail and that there was a large seam in the web: "the insidious character of pipe or slag fissures is a most disquieting feature of the case." Added to this, the section was A. S. C. E. 90-lb., with a thin base, which is not a favorable shape for hard steel rails, as it is difficult to roll it without small cracks, which open up under stress, and which with hard steel will soon lead to a fractured rail. The thicker base of the A. R. A. sections is undoubtedly better suited to the higher carbon rails.

The Lehigh Valley fractured rail had sufficient defects to cause its fracture without reference to the development of transverse fissures in the head by heavy wheel loads, which is the basis of the new theory now advanced by Mr. Howard. It is desirable, therefore, that the investigation be extended to an examination of rails which are made of sound steel. If it can be shown that hard rails which have been in the track two years, as many open hearth rails have been, develop under heavy wheel loads these dangerous cracks in clean steel in the head, then the railway specification as to carbon should be modified. According to this theory, no foreign substance in the steel is needed to account for the transverse fissures, but the fact that they are developed mechanically by excessive wheel pressure remains to be proven. The wheel loads imposed by the locomotives on the derailed train were not high, that on the Atlantic type drivers being about 28,000 lbs., and on the 10-wheel engine 25,000 lbs. per wheel, and the loads on car wheels much less. Wheel loads greater than these have been common practice for over five years, and there probably will be no tendency to reduce them. The rail must be made to endure such pressure without affecting its integrity, and must have sufficient hardness to render a reasonable service in wear, if needed economy in railway operation is to be secured. We believe this can be made and that hard rails will not be abandoned nor wheel loads reduced on account of an occasional fissure in rail heads. Undue importance has been given to this new fissure theory in the apparent attempt to throw the responsibility of rail failures on railway practice in wheel loads and on railway specification in requiring a high carbon content. The theory is not sustained by sufficient evidence, and it would be unfortunate if its presentation in such emphatic language should cause the rail maker to lessen his effort to produce sound rails.

THE RAILWAY LABOR SITUATION. II.

ON the threshold of any discussion of the labor situation on railways one is confronted by the question as to the proper relations between the managements of the railways and the labor unions. Those connected with the transportation industry, like those connected with every other one, hold widely varying and conflicting views on labor unionism. At the extremes of opinion are, on the one hand, those who believe employers should not recognize the unions or deal with them, and on the other hand, those who believe the employer should recognize and deal only with unions and union members; who, in other words, contend for "the closed shop." The *Railway Age Gazette* rejects both of these extreme views.

Considering the matter abstractly, employees, whether those of railways or any other industry, have a moral right to organize to further their interests and protect their rights in all ways that do not interfere with the moral and legal interests and rights of others. It is a question just what kinds of organizations working men may form and what objects their organizations may seek without violation of the Sherman anti-trust law, just as it is a question what kinds of organizations capitalists may form and what objects they may seek without colliding with that statute. The criterion adopted by the Supreme Court of the United States for deciding whether a combination of capital is legal is whether it squares with the "rule of reason"; and, doubtless, reasonableness is its measure of the legality of the form and objects of a labor combination. If a labor organization is in form and purposes reasonable it cannot be immoral or inimical to the best interests of society. Therefore, such an organization is both legally and morally justifiable, and there is no defensible ground on which a fair employer can object to its existence, or to recognizing and dealing with it.

Now, it is reasonable for employees to combine to get good wages and conditions of employment; and their concerted action is reasonable until they seek to so combine as to get an amount of power which would be dangerous to the interests and rights of others; or until they try to get excessive wages or unreasonable conditions of employment or other things they could not obtain without impairing the rights of others; or until in the attempt to attain their ends they use means that violate the rights of others. In the days of small industry, when the capital and number of employees of the largest employer were comparatively very small, the individual employee could, within narrow limits, dictate terms to his employer. Under modern conditions of large industry, the individual wage earner would be helpless in dealing with an employer who was disposed to be unfair, or, while disposed to be just, had wrong ideas as to what was just. Many think that working men, instead of resorting to collective bargaining, should put their trust in the employer's justice and generosity. Unfortunately, labor has no reason for believing in the unfailing justice and altruism of employers. Furthermore, the democratic fermentation which has revolutionized government, and to a considerable extent religious organizations, has extended to industry; and employees now prefer to participate actively in the determination of their wages and conditions of work rather than leave it to even the most generous and wise of employers. They want, not patronage, but to secure what they think they are entitled to in their own way.

Legally, the employer, being the owner, or the representative of the owner, of property, has a right to hire or discharge whom he pleases for good cause or none, and to fix such wages and conditions of employment as his reason, generosity or whim may suggest. Morally, his rights are narrower and his duty broader. They are the correlative and complement of the rights and duties of employees. The employer has a moral right to employ whom he pleases. He has a right to discharge any employee for good cause. He has a right to insist on reasonable wages and conditions of employment, and on efficient, loyal service, and to administer, without meddlesome interference, such discipline as may be necessary to secure such service. In brief, he has the same right to so manage his business—using that word in its broadest sense—as to further and protect all its legitimate interests that the employees have to so act as to further and protect their legitimate interests. He, or those he represents, own the business just as much, and in the same way, that workingmen own their labor or their deposits in the savings banks.

To prevent conflict between these interests, rights and duties of employers and employees, it would seem necessary, on the one hand, that employers shall recognize and deal with labor organizations that are reasonable in their form, methods and objects, and on the other hand, that employees shall concede the "open shop" principle. This principle, rightly understood, is that the employer shall not discourage organization of his employees, or discriminate against those who are organized, but shall, at the same time, be free, without opposition or interference, to employ non-union men whenever he may consider this necessary to the satisfactory conduct of his business.

Even though the correctness of the application of the "open shop" principle, as thus defined, to other businesses may be disputed, reasonable men can hardly question that it should be uncompromisingly applied to the businesses of railways and other concerns rendering a public service. For the managements of such concerns are required by the public to furnish satisfactory, continuous service. Under the "closed shop" system only members of the unions could be employed; and as the unions determine whom they will admit to membership, under the "closed shop" they would have, in effect, power to say whom the railways should employ; and, of course, on whom they employ depends the cost and kind of service they render. In other words, the managers, responsible to the public, would be delegating to organizations that are not legally responsible to the public, the performance of a task which it is the duty of the managers to the public to perform themselves. The managers have no moral right to thus delegate their duty, and employees have as little right to demand that they do so. Furthermore, for railways to adopt the "closed shop" would empower the unions to declare strikes that would withdraw all employees from service, and destroy the continuity of railway operation; and managers have no right to do that, nor employees to ask it.

The relations between the railways and their employees who are concerned in the operation of trains approximate in many important respects to what, on abstract principles, they ought to be. For example, the correctness of the "open shop" principle is tacitly recognized by these classes of employees; and from 90 to 95 per cent. of enginemen, firemen, conductors, etc., belong to the brotherhoods, and the roads seldom discriminate against men on that account. On the other hand, they sometimes employ non-union men, and while usually union members try to get them to join the brotherhoods, they do not object to their employment or retention because they are not union members. Other employees have been less reasonable. No one can have forgotten that last fall the shop employees of the Harriman lines, the Illinois Central and other western roads, through recently-formed federations, explicitly demanded and insisted on the closed shop.

The attitude and course of the shop employees were such that they may well be used as a shining example of the sort of unreasonableness on the part, sometimes of employers, sometimes of employees, that has created the railway labor problem. They sought, by including numerous crafts, to form federations which probably would be in violation of the Sherman law, and to dictate terms to the managers, the granting of which would have been incompatible with the duty of managers of public service corporations. They not only sought, by demanding the closed shop, to limit the supply of men on which the managers could draw, but also sought, by demanding the abolition of physical examinations and personal records, to disable the managers from finding out whether the union members who asked employment were desirable or not. They also attempted to impose many conditions of employment which seemed expressly designed to promote inefficiency in operation. Their attitude was just as unreasonable as would be that of an employer who should refuse to

deal with a reasonable organization of workingmen or to listen to its reasonable demands; was, in short, the sort of attitude which in some cases has caused and justified refusal by employers to deal with unions at all. For the only way employer or employees can meet persistent unreasonableness is first to argue with it and then to fight it; and if, in order effectively to resist it, it is necessary, on one hand, to strike, or, on the other, to adopt the non-union shop, such action becomes justifiable. Strikes and lockouts are war; but war is right and necessary when one of the parties closes his ears to common sense and refuses to heed the dictates of justice. Whether or not the Harriman lines and the Illinois Central will permanently adopt the non-union policy in their shops, we do not know. Perhaps it would not be expedient or reasonable to do so. But if they should, their former shop employees will have themselves and the short-sighted would-be dictators who officered their federation—blind leaders of the blind who led them into the ditch—to thank for it. The view that the course of the shop employees was unwise is not held merely by railway men and impartial observers and students. It was and is shared, we believe, by some of the principal officers of the machinists' union. It was and is shared also by the wiser heads both among the rank and file and among the officers of the brotherhoods whose members are concerned with train operation. The course of the shop employees was as extreme, unwise and iniquitous as the campaign being conducted by the National Association of Manufacturers entirely to destroy unionism.

Unreason frequently has cropped up on other occasions in the relations and negotiations of railway employers and employees. It will continue from time to time to be manifested. But if our views are not wholly wrong, there is no necessary incompatibility wnatever between unionism and efficient management and operation of railways. Such trouble as exists—and there is much of it, and it is serious—is due to the adoption of wrong or tactless policies by the unions, or the managers, or both, and can be remedied by proper co-operation between them. If the unsatisfactory conditions and their results which are complained of are to be remedied, they probably must be remedied by such co-operation. For there is not the slightest real ground for doubting that unionism in one form or another has come to stay. As well expect the modern corporation, which is a union of many capitals, to be abolished, as to expect the abolition of the union, which is a combination of the only form of capital that many possess—their labor.

NEW BOOKS.

Roofs and Bridges, Part III, Bridge Design. Fifth edition. By Mansfield Merriman and Henry S. Jacoby. John Wiley & Sons, New York. 6 in. x 9 in. 414 pages. 185 illustrations. Bound in cloth. Price, $2.50.

The first edition of Merriman and Jacoby's text book on Roofs and Bridges was published in 1894, and the fact that it has been standard in many institutions during the intervening years is evidence of its value. It has been revised four times—in 1896, in 1898, in 1902, and in 1912. The changes in bridge design and construction during the past 10 years have been very important and the present revision was made necessary in order to include practices which have become standard. The principal change in the new edition is the complete rewriting of the chapters on Fabrication and Erection, Highway Bridges, Railroad Riveted Bridges, and several other articles. The subject of erection is added in the first chapter mentioned, the matter being well covered by Warren B. Keim, assistant engineer of the Pennsylvania Steel Company. The chapter on highway bridges is entirely new, being written by F. O. Dufour, assistant professor of structural engineering, University of Illinois. While the new volume gives latest details of bridge practice, the matter is presented especially for students and young engineers, the experience of the authors qualifying them well for presenting the subject to this class of readers.

Letters to the Editor.

STEEL PASSENGER CARS IN COLLISION.

YEADON, Pa.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

The recent disastrous collision on a western railway in which a steel dining car was lifted up sufficiently high to permit of its being driven into and through the superstructure of a Pullman steel sleeping car for a distance of over 30 ft., and, if the report is correct, "shearing the steel of the sleeper off as if it had been cardboard," does not necessarily imply a weakness in steel construction of passenger cars, but only an unusual condition which caused the lifting of the diner and necessarily converted it into a huge shear.

In past years the writer has seen quite a number of locomotives at various times that have had the plates of the smokebox, both with and without extensions, torn for almost their full length by the endwise blows of the wooden sills of cars with which they had been in collision; and also in 1902 the boiler of a large Atlantic type passenger locomotive from which the 30 in. steel dome had been cleanly cut away close to the barrel, by coming in contact with a great boulder as the engine was hurled over a precipice while running at a high rate of speed.

Before anyone feels inclined to take a pessimistic view of the unfortunate accident to the steel Pullman car referred to, and imagine such cars to be very little safer than wooden ones, let him remember the numerous severe accidents through which many of the steel passenger cars have already passed, and also that this accident, with the deplorable loss of life, was not, nor could it under any conditions have been, attended with the added horrors of fire, as would almost certainly have been the case with wooden cars.

This accident only the more strongly emphasizes the necessity of good men in important positions, and the close attention of every man to the duties required of him.

C. H. CARUTHERS.

RAW!

ST. LOUIS, MO., February 10, 1912.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

I quote as follows from the cross examination of George F. Moore, president of the Manufacturers' Railway Company of St. Louis, which is owned by the Anheuser-Busch Brewing Company, by Mr. Colston, assistant general attorney of the Louisville & Nashville, in a recent hearing before an examiner of the Interstate Commerce Commission, in the case of the Manufacturers' Railway Company of St. Louis against the various St. Louis railways:

"Mr. Colston: Do you speak as a traffic man, or are you qualified to speak in that regard, that one line could refrain from paying you $4.50 per car, if other lines published the rate, and hope to obtain any part of the business that you control?

"Mr. Moore: Well, there were other lines did obtain part of the business we control, and did not file the tariffs.

"Mr. Colston: Any substantial part of it?

"Mr. Moore: Yes, a very substantial part.

"Mr. Colston: Tell me which one?

"Mr. Moore: It is answered by this exhibit, if you would care to look at it. The L. & N. for instance, they were not punished because they were one of the last to file tariffs. The Southern Railway received quite a bit of business before the tariff was filed.

"Mr. Colston: You are disgressing from the question. I am not speaking of a punishment for taking any action or standing up for a principle, but I ask you, disregarding any hope you might have of securing a favorable determination of your controversy and collection from the line for not paying you, if there were no question of reparation involved, and the actions of the lines were final, could any line hope to obtain business which you controlled as against a competitor which would pay you $4.50 a car more than the other line would pay?

"Mr. Moore: That is a beautiful question, and I will answer that specifically. The line that paid the allowance would get the business if

there was not any hope for reparation. That is a good question. I like that; that is fair.

"Mr. Colston: Thank you. And that business that the lines did get that were tardy in putting in the allowance, was simply what they got during the suspension of the rate for the others, and pending this litigation, was it not?

"Mr. Moore: Let me hear that again.

"(Question read.)

"Mr. Moore: Yes, sir."

The industrial railway question is so involved and is surrounded by so many complications that almost all that has been said in regard to it has been correspondingly involved. When, therefore, a direct statement is made on this subject, one about which there can be no mistake, it gives one the same feeling that one experiences in a fog on the Atlantic coast when a raw east wind blows away the mist for a moment. It is raw, but it is refreshing. Such a direct statement was made by Mr. Moore in the foregoing testimony.

The first hearing on this subject did not tend to clarify the industrial situation, and the three opinions of the commission have, thus far, only added to the mistiness of the situation. The majority of the commission holds that the railway is a common carrier, but cautions the railways that they must make no allowances to it for work which is in the nature of the work of a "plant facility." This opinion has been variously interpreted, but there is only one interpretation which can be given to the testimony of the president of the Manufacturers' Railway when he said, "the line that made the allowance would get the business."

It is rather unusual for officers in charge of industrial railways to state so frankly that they give their business to the railways which make allowances to them. There has been a general feeling, indeed, that such a proceeding is illegal. There never would have been any Manufacturers' Railway case if the St. Louis railways had not been afraid of granting these allowances to the Anheuser-Busch Brewing Association through its railway. They thought the allowances were illegal. They withdrew them, for several months, and then in the uncertainty which prevailed after the commission's opinion appeared, they restored them.

The Manufacturers' Railway is asking that these back allowances be paid in the guise of "reparation," and they have been very careful to try to explain that there is no undue profit in the allowances involved.

Now their president says plainly that the traffic of the Anheuser-Busch Brewing Association is to be used to coerce the railways into paying allowances, and this in face of the views upon the subject very plainly expressed by the commission in its last annual report.*

There is no precedent for so frank a statement as this by the responsible officer of an industrial railway. The traffic managers of the industrial railways, who are usually also traffic managers of the industries which own them, are almost, without exception, gentlemen of traffic experience and of extreme tact. If one of them were asked the same question in an investigation of this kind, it is easy to predict the tortuous and unenlightening nature of his reply. Even when these gentlemen are "applying the club" to recalcitrant railways, they do it carefully and mildly. They never threaten even when they put their case most convincingly. It is probably on account of the peculiar experience of the gentleman in question that his testimony is of such a direct character. Controlling, as he assumes to do, the vast tonnage of the brewing corporation, which is estimated by the Interstate Commerce Commission as one-thirtieth of the total railway business of St. Louis, he appears to have encountered so little opposition in forcing his views that he has not found it necessary to beat about the bush.

It is almost a pity that the Manufacturers' Railway should have so given its case away, as there are many grave questions in connection with industrial railways for which we are looking to the Interstate Commerce Commission for guidance, and which it was hoped this case would settle.

The commission has pointed out plainly what shall be done in case an industrial railway serves only one industry, but it has not drawn the line in cases where an industrial railway serves more than one industry. Indeed, although the commission is in the habit of alluding to all of its decisions on this subject as if they were of a uniform tendency it is difficult to reconcile the old ones with the new, and the only attempt to lay down a rule which could apply to all such cases is the opinion of Commissioners Lane and Meyer in this very case. Although this opinion technically concurs with that majority opinion which has caused so much confusion it is very different from it, in that it suggests that all of the industrial cases could be settled if the railways were to so amend their tariffs that the terminal charge should in all cases be separated from the transportation charge. There are immense difficulties to be overcome before such a policy can be adopted by the railways of this country, but the suggestion is certainly a logical one and appears to be applicable to all cases.

It is to be hoped that this admission of the Manufacturers' Railway that it is doing what the commission itself says, "even if legal in form is illegal in fact," has not so prejudiced its case that the final decision, when it is handed down, will settle this case and no other. What the railways need to settle this industrial question is a broad indication of the policy of the commission.

RAILWAY MAN.

*"The evils most difficult to detect and to prove today are those arising out of the community of interest of certain carriers and industrial corporations. The ownership of industrial corporations by carriers and of carrier corporations by industrials is frequently taken advantage of to defeat that equality between shippers which the act contemplates. This is accomplished by unreasonable divisions of joint rates. forced upon the carrier by powerful shippers who control industrial railroads. Such arrangements may be legal in form, although certainly illegal in effect. We find that a certain number of large industrial concerns control tracks and terminal facilities nominally owned by small railroad corporations which do not rise to the dignity of common carriers, but which are treated as such by the connecting carriers. As a result, the connecting carriers make a switching allowance or a division of the joint rate to such terminal lines, which practice unquestionably results in discrimination and places the industrial at an advantage in the market. Another form of discrimination is found in the leasing of property by carriers to shippers for a nominal consideration with a further agreement that all shipments made by the lessee shall be routed over the lines of the lessor.

"It becomes increasingly evident that entire freedom from discrimination can be secured only by a complete separation of the business of transportation from every form of commercial or industrial enterprise."—Extract from twenty-fifth annual report of Interstate Commerce Commission.

RAILWAY ECONOMY AND EFFICIENCY.

Ennis, Tex., December 20, 1911.

To the Editor of the Railway Age Gazette:

Just at present everybody is engaged in regulating the railways, and many of our most ardent regulators are entirely too prolific in theories which are not evolved from actual experience.

The efficiency theorist showed conclusively that a million dollars a day could be saved by the adoption of Midvale shop methods. The theory was correct, but not even the man who advanced it would undertake to apply it in railway shops. The bemis and piecework plans have been on trial for years on various railways, but no advantage has been developed of sufficient magnitude to make the plans universally acceptable. Both schemes are strenuously opposed by organized labor and piecework cannot be supervised closely enough to make the work as safe for locomotives and cars as day work.

The Illinois Central's experience with piecework is an indication of what may be expected from piecework in car repairs. Piecework or contract work, which are almost identical on railways, has always offered too many opportunities for leakage.

After removing the halo from efficiency we are told that efficiency only means economy in an intensified form, and that

we are woefully wasteful, in face of the fact that we can and do haul a ton of freight ten miles for seven cents, pay good wages, use the best material obtainable, and make money at it. The cost of transportation was reduced almost every year while the railways were managed by railway men, but there has been no material reduction in the past few years, and there is likely to be none until conditions change.

We can legislate railways into bankruptcy or out of existence, but we can't legislate a mile of railway into existence, nor an existing bankrupt railway out of debt.

The high tide of prosperity which rolled over us in 1906 found every western and southern road unprepared, fully illustrating our need of more and better equipped railways. Another such year would find the same condition. Very little has been done, because very little could be done. Improvements could not be made from earnings because expenses have been heavily increased in a supreme effort to satisfy the laws, the public and the employees. The economy theorists who charge extravagance and seem to show by tests and diagrams that millions could be saved, apparently overlook the fact that economy has been the war cry on every railway since the wheels began to go round, and that every ounce of gray matter owned and operated by every railway official in the country is being exercised every day and a portion of every night in efforts to cut down expenses.

Economy has been carried to such an extreme on railways that it is positively dangerous to economize further. The need of the present is an intelligent expenditure of several hundred millions of dollars to bring our half-baked railways up to a state where they can be efficiently and economically operated. Outside of five or six of the very old eastern roads we are blocked, cramped or congested during every crop-moving season. Terminal facilities in all of our large cities are travesties, there are very few miles of double track, and still fewer miles of perfect single track, hundreds of miles of rickety wooden trestles and bridges, many obsolete engines and few properly equipped shops and roundhouses. In the meantime every business is growing except the railway business, and no hope can be entertained from increased revenue, nor can any inducement be offered for new capital to enter the field, either to improve existing lines or to build new ones.

Reverting to the economy theories, one writer suggests that the railways ascertain the lowest cost for putting in ties, and with that figure as a basis contract for putting in all ties needed. Theoretically, that would be economical. Practically, every well informed railway man knows what it costs to put in ties; he also knows that he can put in ties cheaper than any contractor can, and he also knows that all track built by contract has to be rebuilt before it is safe for trains. It requires close supervision by a competent foreman, who has the company's interest at heart and his job at stake in order to get ties properly applied.

Other theorists point to heavy losses in fuel consumption, and we all know that there are losses. The subject has had more study, perhaps, from the economy standpoint than any other. Every method known to theory or practice has been tried, even to reburning the smoke, and after all nothing better has been found than an intelligent fireman, who takes advantage of the particular conditions met with in the different trains, engines, coal, grades and weather that he may find necessary to know in order to get the best results. This knowledge he must gain by actual experience and practice.

Years ago many roads adopted the practice of keeping a record of the fuel oil used and wasted by each engineman during the month, compiling a list each month showing the amount of supplies used and the miles run by each man, and posting this list so that each could see where he stood. The practice has been to some extent discontinued, and it is safe to assume that this would not be the case if it had been found to effect a saving.

It is highly improbable that any two trains have ever run over any road under exactly the same conditions. No two engines steam exactly alike, no two tanks of coal and no two tanks of water will produce like results in steam, no two trains require exactly the same inertia to move them. Then, there are to be considered variations in drawbar slack, the adjustment of brakes, variations in journal friction, moisture on the rail, length of train, variations in friction of trucks in rounding curves, and the condition of the weather. The amount of fuel required depends on all of these and many more conditions, and it is a wise fireman who can take every advantage presented on a trip.

In a recent article by L. C. Fritch, published in the *Railway Age Gazette*, a table is presented showing the number of miles of railway operated and the total cost of fuel used each year for the past ten years. As an exhibit of the vast amount expended for fuel each year it is undoubtedly correct, but it does not show whether or not the railways are gaining in fuel economy.

Every division superintendent on every well organized road, as well as his subordinate officers, knows each month the exact cost of fuel on his division, not only for each month, but for the corresponding month in the preceding year, and also the cost of every other item of expense charged against his division. His fuel expense is shown in tons of coal or barrels of fuel oil, as the case may be, as well as in price per ton or per barrel, together with gross ton miles and net ton miles run per ton of fuel, locomotive miles and train miles per ton of fuel, and this expense is segregated as between passenger, freight and switching service. Explanations are in order to cover any unfavorable comparison, and in almost every instance an improvement is urged.

Practically all roads are using, or have tried every means known to science, theory and practice to reduce their fuel expense, and there are but few that have not in their service the best informed men that can be found, whose sole duty it is to reduce fuel consumption. In the article by Mr. Fritch above referred to, results of a very satisfactory fuel test are shown, but it does not follow that the same results could be obtained in ordinary practice, not that there was a real saving in dollars and cents in the actual test. In making the test the same locomotive and the same crew were used on a run of 446 miles on a passenger train. Such a performance could not be duplicated on half a dozen of our railways. Over half the trip a second crew was used, as pilots, and we may assume that this second crew was paid for 446 miles, as it undoubtedly had to deadhead back. The cost of an engine crew for that mileage under our western schedule of $4.40 per 100 miles for enginemen and $2.65 for firemen would amount to $31.44, and this amount would likely buy more coal than was saved. Besides, there was probably a high-priced expert or two at $8 or $10 per day; but of this we are not advised. So unless the test developed just how to fire an engine in order to save fuel, and this method can be applied under ordinary conditions, and railways can succeed in having firemen learn and use the method, we must conclude that the test was of little value.

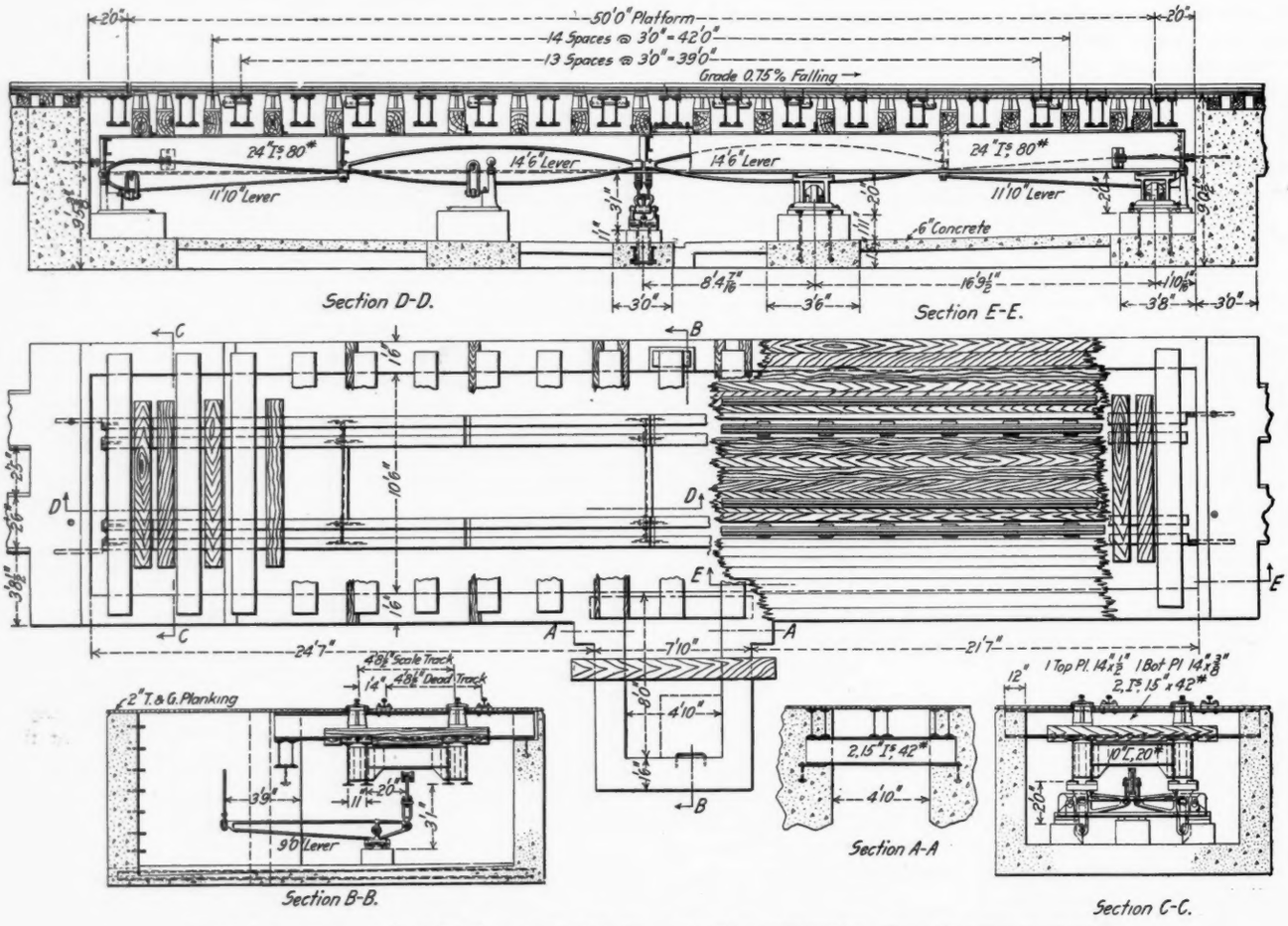
Railways practice every economy that they have been able to devise that will save money. The practice of economy at any cost is an entirely different matter. The economy germ has been boring into the railway official since before the epizootic epidemic. One of our early childhood recollections is the story of the economical roadmaster who discharged his foreman if he found as much as a lost spike on his section. He often walked over sections on the look out for waste material, and one day found a spike on Hogan's section. When he got to Hogan's gang he called the boss and pulled out the spike; but before he could explode, Hogan jumped for the spike, yelling: "My God, did yuh find ut? I've had Casey out three days looking for ut. I knew we lost ut!"

J. F. SUGRUE,
Assistant Superintendent, Houston & Texas Central R. R.

TRACK SCALE ON THE BALTIMORE & OHIO.

BY L. D. DAVIS,
Chief Scale Inspector, Baltimore & Ohio.

The Baltimore & Ohio organized a scale department in 1909, with a chief inspector in charge, to give general supervision to the installation, maintenance and testing of scales. In January, 1911, the duties of this department were extended to include all matters pertaining, in any way, to the subject of scales and weighing, and the former scale department was merged into a weighing bureau. One of the first things to be done, in 1909, was to adopt a track scale, which, in design and method of installation, would meet the requirements imposed on it. Although the Baltimore & Ohio, at one time, made all of its scales, it was decided not to manufacture these scales if suitable ones could be purchased at reasonable prices. Detailed drawings and specifications, covering a four-section, 300,000-lb. capacity, "pit-suspension-bearing" scale, were made, and the design and method of installation described herewith were finally adopted.



General Arrangement of Baltimore & Ohio Four-Section, 300,000-Lb. Capacity Track Scale.

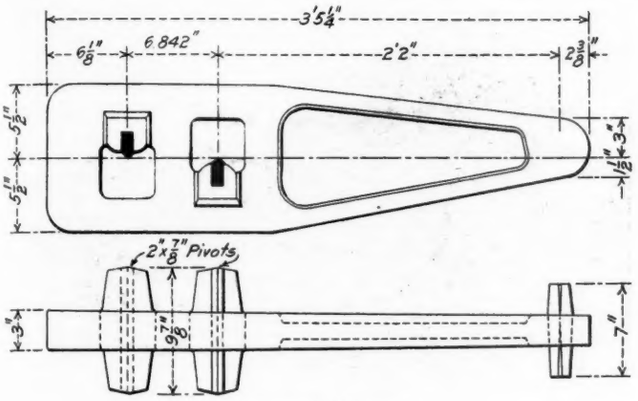
A scale of four sections was adopted for the following reasons:—First, it consists of only 14 levers up to the beam, while the general type of five and six section scales have 18 and 22 levers respectively, and accordingly a greater number of pivots, bearings and connections. Second, the decreased number of levers, pivots and bearings reduces the total amount of friction without materially limiting the strength or the life of the scale. The governing factor in a scale is the capacity per section, as the weight of half a car is practically concentrated successively on each section. Third, in a four-section scale the force applied at the load supporting stand (except at the fifth lever, which transfers the load to the scale beam) acts downward on the foundation and is controlled better than when acting upward, as in the general types of scales of more than four sections. Fourth, on account of the fewer number of parts, bearings and connections, the scale is more sensitive; its adjustment is better maintained and it is easier to repair.

All levers and other parts were designed to carry a load of 75,000 lbs. per section, allowance being made for dead-weight, and 100 per cent. for impact. The main and the fifth levers, the cross-bars and the rocker are made of cast steel, while all other levers are made of cast iron. Although it is intended that the scales shall be used for weighing cars, it is necessary that they be made of such capacity that any rolling stock may pass over them without danger of injuring them. They were not only designed for a safe working load, but also for keeping the deflections of the levers at a minimum. When a lever is deflected its two arms are liable to have different relative positions under different loads, and this interferes with its proper adjustment, making the scale more or less inaccurate.

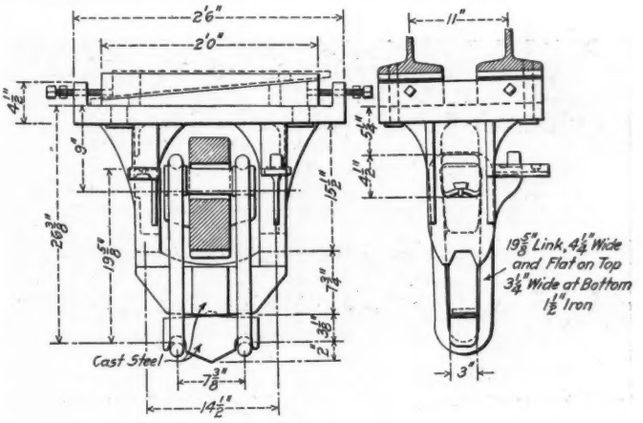
By referring to the drawing of the main or transverse lever it will be seen that it differs materially from the usual design. This lever permits a bearing on the entire length of both of the main supporting pivots, which are 9⅞ in. long, or an increase in length of about 70 per cent. over those used in the common 200,000-lb. capacity scales. Another feature of the design is that the pivot line is located in proper relation to the neutral axis, as it is in the other levers. The scale stands are rigidly supported by concrete foundations, and the load is supported at eight points on the middle pivots (commonly called the knife edges) of the main levers. From these the load is transmitted and reduced through the extension, fifth and shelf levers, to the beam, at which point a force of 1 lb. balances a weight of 800 lbs. on the scale.

The construction of the suspension bearing is shown in detail,

and, as shown in the section *CC* of the general arrangement of the scale, the load is transmitted from the rail through the scale stands, the ties, I-beams, or bridge, to the bearing yoke, and then to the cross bar and rocker. The rocker is suspended by two 1½-in. links, hung from a bearing block, which rests on the knife edge of the main lever. The arc of suspension from the base of the rail to the bottom of the rocker is 79 in., which gives the platform a freedom of action with sliding friction, longitudinally, between links, rockers and bearing blocks and a transverse pendulum motion on the main lever pivot. The rocker



Transverse Lever.



Suspension Bearing.

compensates for any deflection there may be in the bridge, and a uniform bearing on the knife edge is always secured.

The wedges, as shown on top of the bearing yoke, provide the means of securing a uniform distribution of the load on each section, which might otherwise be prevented through the unevenness of the I-beam, the installation, or the wear of the scale parts. The extension lever stands are provided with compensating steels. Another important detail in the construction of these levers is the accessibility of the nose iron pivots, and the means provided for proper alinement of these levers. They are also fitted with leveling tabs on the top of levers.

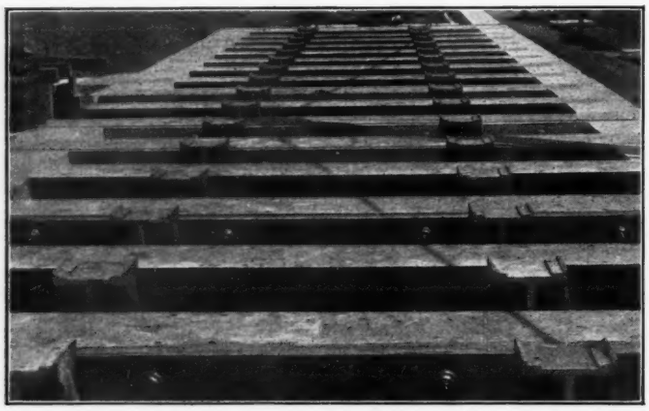
Two of the most important features given consideration in both the design and the installation of the scale were simplicity and accessibility. All pivots in the scale are accessible for inspection and cleaning. The scale pit is 54 ft. long by 10 ft. 6 in. wide and 7 ft. 3 in. deep, and is equipped with electric lights. In general, more scales rust out than wear out, and the short life and inaccuracy of many scales may be traced to lack of attention in the way of cleaning, inspection and testing.

The method of installation is shown in the various illustrations. The main lever stands rest on 2-in. bed plate castings, which are anchored to a concrete pier through slotted holes. The main lever stands have slotted holes in a direction at right angles to this, permitting some adjustment, lengthwise or crosswise, which may be found necessary in the installation. The bed plate castings are planed, as are the bases of all scale stands, so that a true seat on the foundation is secured. The bearing blocks, cross bars, rockers and bearing yokes are machined to exact dimensions, and all loops and links are not permitted to vary more than 1/16 in. In this way the parts of the scales are made interchangeable and repairs can be promptly made. The extra machine work throughout its construction undoubtedly compensates for the increased weight, as is shown by the sensitiveness of the scale.

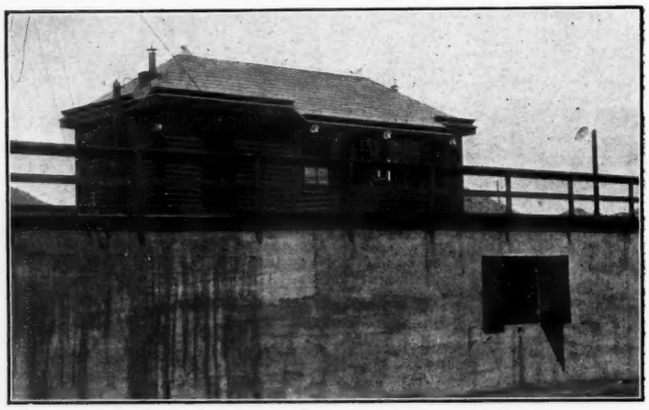
The bridge is made up of two 24-in. 80-lb. I-beams under each scale rail, so as to provide the necessary rigidity and to better distribute the load over the bearings. The ties crossing the I-

Baltimore & Ohio Track Scale.

beams provide a cushion and protection to the scale, and, in addition, serve to brace it. The grade on hump scales is made with them, they being adjusted to 0.75 per cent. grade. The dead-rail and platform are carried on 15-in. 42-lb. box beams, which are supported by the side walls, entirely independent of the scale construction. The scale rails are carried on cast iron stands projecting through the platform, and the opening is protected by ¼-in. shields, bolted to the scale rails. The floor is not framed around the stands, but runs parallel with, and ¾ in. from them on each side. On the edge of the floor are placed 1½ in. x 1½ in. x ¼ in. angles, which keep the water from the opening and prevent dirt from getting into the pit. A 1⅞ in. x 6 in. tongue and grooved platform has been used; while it was not thought that this would make the pit waterproof, yet by the application of white lead to some joints, and pitch in others, a considerable amount of water and dirt is kept out, and experiments are being made with a view to getting a tighter deck.



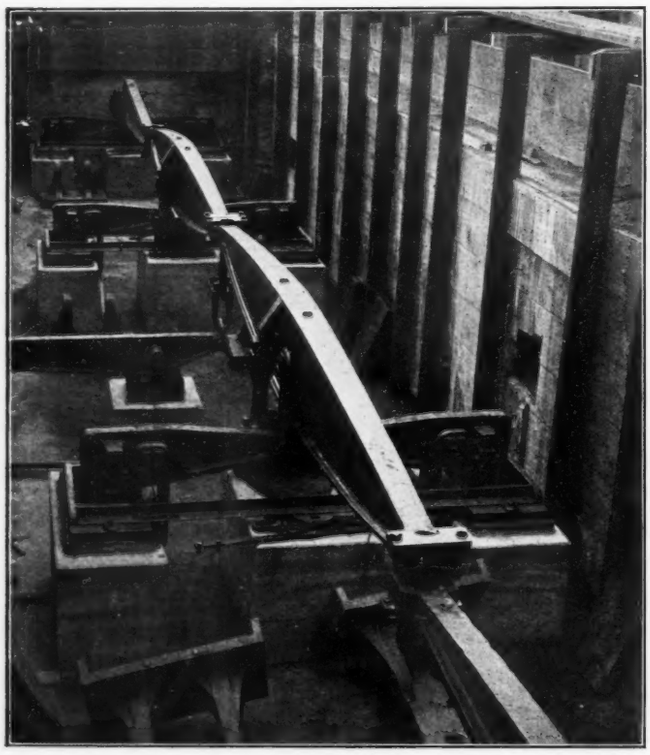
Scale Track Supports.



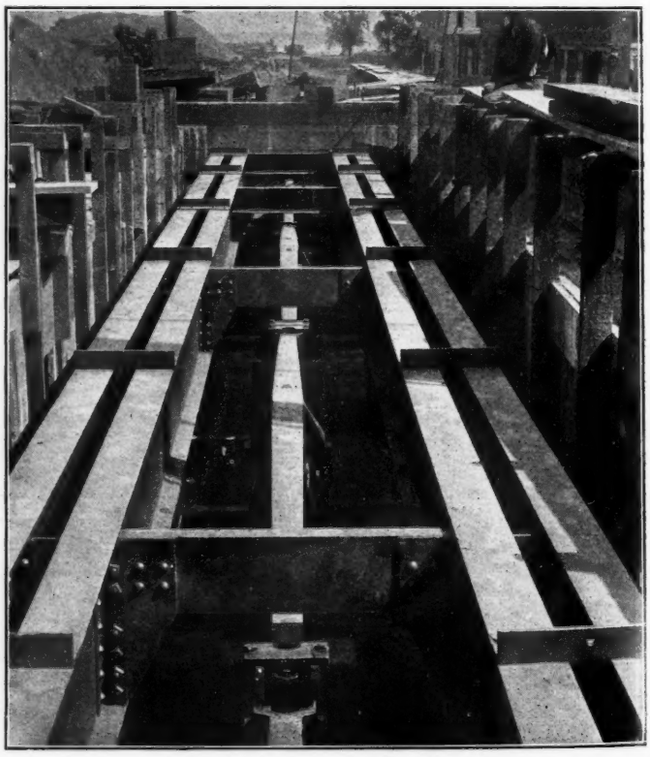
Location of Track Scale, with Door for Ventilation and Light.

It will be noted that the scale parts are 54 in. long, while the scale rails are but 50 in., which results in the load being applied to the scale inside of the first bearing, thereby distributing a part of the load to the second bearing and preventing a reflex action of the bridge. In order to further relieve impact on the scale, a buffer or transfer rail, made of manganese steel, is used to transfer the load from the approach to the scale rail. This is bolted to the approach rail and the box beams, and carries the outside tread of the car wheel. The buffer is in no way connected with the scale, plenty of clearance having been provided by cutting it out underneath and planing off the outside head of the scale rail.

The views, as shown, were taken in most cases before the forms were removed. The scale walls are built up to within an inch or two of the bottom of the floor beams, after which the scale and bridge are installed. The box beams are then set to the proper elevation and grade, and the walls finished flush with the top of these beams. The Baltimore & Ohio has just finished installing two of these scales in connection with improvements at Fairport, Ohio, on Lake Erie, which is its principal ore port. One view shows the scale located on the hump installed alongside of a street. An opening has been provided in the sidewall, which is done in all cases where possible, so as to light and ventilate the scale pit. There is no opening in the floor to the pit, but access is obtained through the basement of



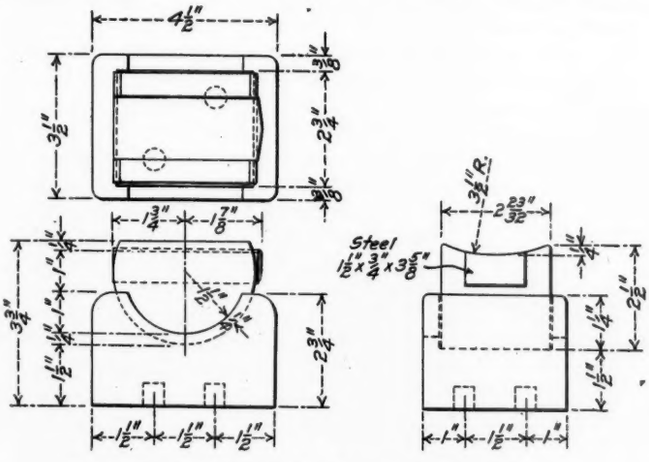
Lever Arrangement for Baltimore & Ohio Track Scale.



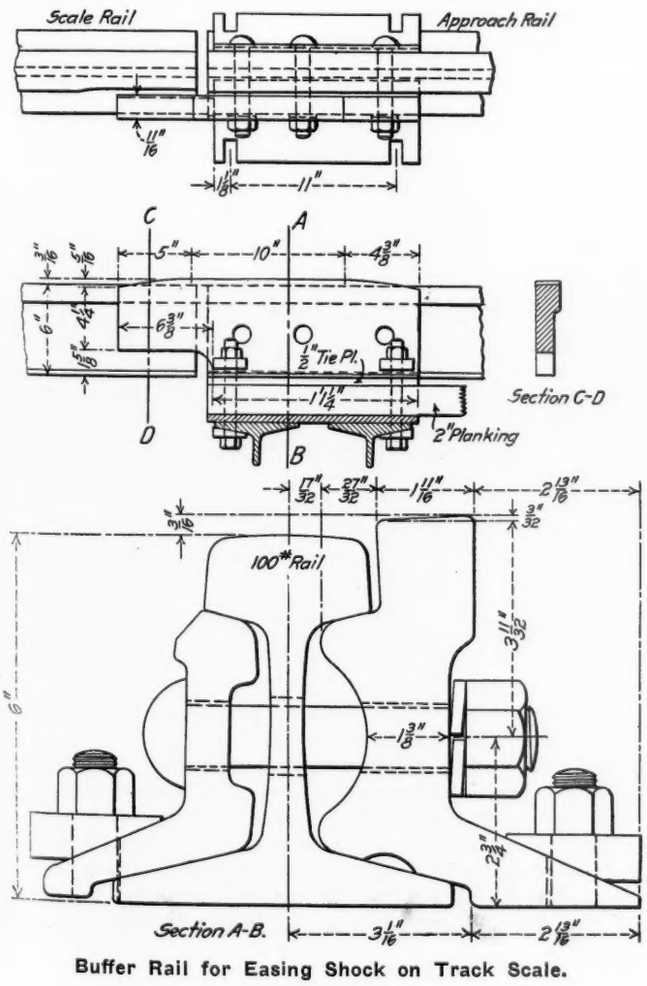
I-Beams for Bridge of Track Scale.

the scale house and the fifth lever outlet of the pit, which has been left open.

In addition to these two scales, 20 others of the same type have been installed at various points on the lines of the B. & O. since January, 1910, and eleven more have been authorized to be installed during the present year. The first of these scales, installed in January, 1910, had weighed, up to the first of February, 1912, approximately 330,000 cars, or 14,000,000 tons, and another, installed in March, 1910, had weighed, up to February, 1912, approximately 213,000 cars, or 9,000,000 tons, without having been out of adjustment in that time, nor does inspection show perceptible wear. The scales are tested every 30 to 60 days, with a scale test car, and are cleaned at least once every week, all the bearings being wiped with waste dipped in oil. This has prevented almost entirely the rusting of scale pivots, which is so destructive. Briefly stated, the results obtained from these scales are attributed:



Compensating Steels in Extension Lever Stands.



Buffer Rail for Easing Shock on Track Scale.

To the suspension principle of design.

To the rigidity of the design and installation, which results in less deflection and movement of the levers, thereby reducing friction on the pivots.

To their accessibility.

To extra refinements in the way of compensating steels, interchangeable parts, lining wedges, and general machine work.

To the increased length of the pivot bearing, resulting in a smaller load per lineal inch of the bearing.

To the regular attention which they receive in the way of inspection, cleaning and oiling, which has prevented rust and accumulation of dirt and general deterioration.

NEW JERSEY REPORT ON FULL-CREW BILL.

The Public Utilities Commissioners of New Jersey, R. Williams, T. J. Hillery and W. M. Daniels, have issued a report on the proposition which was before the legislature of that state a year ago, to enact the full-crew law, having been requested by the Senate to investigate the subject. The board disapproves the bill on the ground that it was too rigid for general application. The bill was No. 83, introduced by Senator Leavitt. It is crudely drawn, but contains in substance the usual provisions; one flagman and two brakemen on a freight train; a conductor and a flagman on an engine without train; and one brakeman and one flagman on all passenger trains of five cars or more. Any corporation or individual operating a railway within the state would be liable, for each offense, of from $100 to $500 penalty. The commissioners held a hearing in Trenton on November 1, and in Newark on November 15. Following are the essential parts of the report:

There can, of course, be no denial of the proposition that the crews which operate trains should be adequate to afford safe, proper and adequate service. The provisions of Senate Bill No. 83, however, appear to us to be too rigid, mechanical and drastic, and not framed so as to insure the most economical attainment of the end in view. The bill is question makes the number of cars carried on a train the exclusive determinant of the size of the train crew. It is incontestable that there are other considerations which ought to be weighed in determining the size of a train crew. Among such considerations are the number of stops which a train is scheduled to make, the seasonal alterations of operating conditions, the difference between through and local service, both freight and passenger, the amount of switching required and the conditions under which it is performed, and the differences in grade over which trains are run. All of these factors, and possibly others, such as the number of porters on trains carrying chair-cars and sleeping-cars, are legitimate determinants of the proper size of a train crew, and are entitled to legitimate consideration no less than the number of cars carried.

An essential part of the service required of the trainmen of a passenger train is connected with supervising the embarkation and alighting of passengers. An immigrant train, for instance, scheduled to make a single stop in its journey through New Jersey would require a minimum of trainmen's service of this character. . . . Another train, carrying hundreds of commuters and making numerous stops, will involve a very considerable amount of work of the character described. To prescribe a sixth train hand on all passenger trains carrying five or more coaches, with no reference to other conditions, would quite ignore other valid considerations. The differences just illustrated exist in some degree when the requirements of through express trains are compared with the requirements of local or accommodation trains. Particularly marked, also, is the contrast between through freight service and local freight service.

The through freight may move across the state without taking on or putting off a car until tidewater is reached. The local freight may drop and pick up cars at every station. It is quite conceivable that a through freight train carrying 60 loaded cars in its journey through the state may require of the crew less work than a local freight train of 10 cars on a 10-mile trip. It seems therefore manifestly unreasonable to prescribe the extra trainman simply on the grounds that 30 or more freight cars are carried.

The totality of complex conditions under which trains are operated is the essential determinant of the size of the crew. . . . There is evidence that a heavy down-grade, especially in winter, necessitates a greater number of train hands to work the air-brake retainers, when necessary, than when the train is moving upon a general up-grade. . . . Another objection to the proposed measure is that it does not, with sufficient explicitness, provide for train movements within a yard as contrasted with runs upon the open line. Nor does it define in any way the length of run which might be permitted with a train crew of less than the designated size. Trains operated by electricity would have no use for the "fireman" named in the bill.

There is also to consider the questions how far the operation of trains with crews of the present size is safe, and how far the additional expense entailed by the proposed bill would add to safety. At the two public hearings the advocates of this measure were unable to cite any serious accident resulting from the employment of insufficient train crews. It is true that two or three minor accidents were cited where a passenger alighting tardily was not sighted by a trainman until the train was in motion, and where slight injuries resulted. But nothing like proof of frequent or serious accident resulting from too meagre provision of train hands was forthcoming. In our opinion this is significant; and while, as will be indicated later, a real shortage of trainmen's service is in some instances probable, the test of experience does not negative the allegation that train crews at present are on the whole competent to afford safe and adequate service, both passenger and freight. Statistics showing the general mortality among employees, or even the increase in such mortality, are not in point as evidencing accidents that have resulted from under-manned trains.

In case it is the fact that, barring some exceptional cases, the train crews as at present made up are able to afford fairly safe and adequate service, the cost entailed by Senate Bill No. 83 ought to militate against its enactment. One company estimates the added cost to it under the law would be one hundred thousand dollars per year, and an even larger estimate of the extra cost was presented by another carrier. The extra cost, if not compensated by solid advantage accruing to the patrons of the roads is a public and social waste. It will be recouped by the companies, if they can recoup it; and will not improbably lead to the postponement or abandonment of improvements, some of them already projected, whose advantages to both the companies and their patrons would be greater than the added advantage resulting from the automatically enlarged crews.

There is also some appreciable weight to be given to the view that a uniform enlargement of train crews, where such enlargement is demonstably unnecessary, will make against the maintenance of proper discipline in the service. . . . The general equipment of trains with automatic brakes has quite transformed the work of the brakeman.

We do not give unqualified assent to the contentions urged on us repeatedly by the railway companies that their corporate self-interest is a complete guarantee that adequate train crews will always and everywhere be provided on every train. This board's inspectors have discovered instances in the case of certain carriers where economy has been pushed beyond the limits consistent with safe service to the public. Thus, the withdrawal for a time of trackwalkers upon an important line was an instance of economy pushed to the verge of peril. One witness cited certain West Jersey & Seashore trains. On an electric train of five coaches and, carrying upwards of five hundred passengers, the train crew consisted of but three—the engineer, the conductor and one extra trainman. . . . Sometimes the rear trainman, by reason of collecting tickets or some other work, is found too far forward, occasionally in the fourth car from the rear. In case of a sudden stop, it is his place to protect the rear of the train with flag or lantern. It might happen that delay to reach the rear of the train promptly would result in accident. In all probability there are certain instances, perhaps not numerous, but nevertheless real and pressing, where train crews ought to be increased.

The companies have contended that under the Public Utilities Act this board has power to require the enlargement of train crews.

The board thinks that under the sections cited, it has the power to order an increase in the size of a train crew where such increase is necessary for the carrier to "furnish safe, proper and adequate service." But with a force of three, or at times of four, inspectors in the railway division, the board must provide for the inspection annually of some thousands of miles of track with their bridges. It must investigate every accident resulting in serious injury or in loss of life. It must inspect the locomotives and equipment of railways operating in the state. These tasks, with the investigation of manifold miscellaneous matters, fall primarily upon the inspectors. Nor is this a plea for more inspectors. The work which requires the entire time of hundreds of experienced railway officials cannot and ought not to be duplicated by the employees of a state board. . . . To correct the ordinary case where the crew is inadequate, the board would have to be apprised by a complaint lodged with it. The board is anxious to expedite hearings on complaints, but the interchange of pleadings, the frequent requests for adjournments, and the time required for the hearings themselves, often involve a period of some weeks before an order can issue. Some carriers have resorted to the courts for a stay of the board's order. This is, of course, their legal right and privilege. But the frequent demand for specific and mandatory statutes regulating railway operation is fomented by the feeling that obstructionist tactics may be resorted to when regulation is attempted by administrative orders. . . . While this board disapproves of Senate Bill No. 83, as defective and erroneous in principle, and while it believes that a preferable policy is to allow this board, under its present powers, to order an increase of a train crew, when found necessary, it suggests that a more expeditious procedure may have to be provided by statute, if experience demonstrates that administrative regulation is not effective.

Hongkong importers who expected a revolution in the trade of the Yunnan and Kwangsi provinces in South China as a result of the operation of the railway from Haifong to Yunnanfu, have come to the conclusion that under present conditions much of the expected expansion will prove impossible. There has been a considerable increase in some lines of trade into and from these provinces, but the increase has been due, to some extent at least, to generally improved conditions and internal development in the provinces, and in spite of drawbacks due to railway conditions. The usual direct results of railway service have been minimized by interrupted service, troublesome customs and other charges, and particularly by high freight rates. In spite of the opening of the railway, freight is still imported into Yunnan, Kweichow and West China by rail through Burma, thence by pack train to Bhamo and on to Tangyueh, in the province of Yunnan, and then to Batang, in the province of Szechwan, about 400 miles north, or to Talifu, and even to Yunnanfu, whence the goods are distributed all over that part of the country, as they have been since the beginning of the trade. These costly means and tedious routes are used in spite of what would seem to be the manifest advantages of the rail route to Yunnanfu or to intermediate points and thence by the natural caravan routes to various points in the West China. The expected change in the direction of imports has not been realized, and present indications are that the railway transportation charges over the line to Yunnanfu will have to be modified before any change can be expected.

FRANK TRUMBULL.

Frank Trumbull, chairman of the board of directors of the Chesapeake & Ohio and for some time one of the most active directors of the Missouri, Kansas & Texas, has been elected chairman of the board of directors of the Missouri, Kansas & Texas, succeeding Edwin Hawley.

Before buying, with Mr. Hawley, control of the Chesapeake & Ohio, Mr. Trumbull was president of the Colorado & Southern. Under his management the Colorado & Southern was built up physically and financially, starting with two bankrupt Colorado railways, to a railway tapping a good part of the richest sections of Colorado and running to the gulf of Mexico, and a property which the Chicago, Burlington & Quincy was glad to buy.

Sometimes a successful man has some one quality which may or may not have contributed to his success, but which is associated in the mind of everyone who knows him with the man himself as much as is his name. It is probably not an exaggeration to say that nearly everyone who has ever come in contact with Frank Trumbull has been impressed with the courteous consideration that forms so essential a part of his character. Not only those who have been associated with him in business but those who have worked for him as well have enjoyed and felt this considerateness. This is true, despite the fact that Mr. Trumbull is a very rapid, nervous worker who has been in harness, with hardly an interruption, since he was a young boy.

Frank Trumbull.

As a railway man, he has been a real all-around railway man and not a speculator. His policy on coming to the Chesapeake & Ohio was one of expansion and aggressive progress. He realized the possibilities that lay in the development of a soft coal road, running with low grades far enough west so that it needed but a short link to connect it with the lakes and thus make it a trunk line. This connection Mr. Trumbull gave the property, first by the purchase of the Hocking Valley, and later by the purchase of the old Chicago, Cincinnati & Louisville. Personally owning a large block of stock of the Chesapeake & Ohio, Mr. Trumbull's aim has been to expand its property only as fast as it was financially feasible; to earn and pay an actual and not a nominal dividend to its stockholders, and to carry forward as rapidly as possible a very extensive policy of betterment and improvement. It is a fact well worthy of consideration that in neither the Colorado & Southern case nor with the Chesapeake & Ohio has a policy of expansion been allowed to interfere in any way with the upbuilding of the property and its continual betterment. The Missouri, Kansas & Texas needs such a policy.

Mr. Trumbull was born in Arcadia, Mo., in 1858, and began railway work when he was 16 as a clerk in the comptroller's office of the Missouri, Kansas & Texas at Sedalia, Mo. He had already been at work for four years as clerk in the post office and country store at Pleasant Hill. On the M. K. & T. he worked seemingly naturally into the accounting department and was at one time a traveling auditor. In 1881 he went to the Missouri Pacific, continuing chiefly interested in accounting, and in 1886 he was selected as an adviser for the receivers of the Texas & Pacific. In July, 1888, he gave up his direct connections with railway work and was interested in the coal industry being rapidly developed in Colorado. At this time, however, and at various times during the next five years, he was engaged by New York or London bankers to make reports on railways and other properties in the West. On December 18, 1893, he was apopinted receiver and general manager of the Union Pacific, Denver & Gulf, and in August of the following year was made also receiver of the Denver, Leadville & Gunnison. In 1899 the roads were reorganized as the Colorado & Southern and Mr. Trumbull was elected president of the new company. From 1899, when Mr. Trumbull became president, until 1908, when he sold his interest, which together with Edwin Hawley's constituted control to the Chicago, Burlington & Quincy, the net earnings of the C. & S. increased by ten times.

It is unusual for a man to work his way to the top through a railway accounting office, and yet it seems in a way rather surprising that it should be unusual. It is not at all unusual, or was not, for men to work their way from a bookkeeper's desk to membership in the firm in mercantile business. The reason that so few railway presidents have come through the accounting department is probably due to the fact that in a railway accountant's office the figures are so numerous and in such detail that a man, unless he has an extraordinary broad grasp of the meaning and relative importance of statistics, is swamped and loses all sense of the fact that his work is simply a translation of facts.

The Russian government has granted concessions to corporations to build a considerable system of railways in the territory south of the Siberian Railway in the valley of the upper Obi river, on the west shore of the Altai mountains. One line is to be built from the Siberian Railway south by west through Barnaul to Semipalatinsk and Bijsk, 505 miles, another line is to be built from Aris, a station on the Orenburg Railway, about a 100 miles north of Tashkent, eastward to Pishpek, and later to Wierng, 430 miles; while the government itself will build a line to connect these two. Only the mountains lie between this territory and Mongolia.

EXTENDING THE AUTHORITY OF THE STATION AGENT ON THE FRISCO.

The St. Louis & San Francisco is working out an interesting plan for enlarging the authority and responsibility of its station agents. The plan is based on the idea that this class of employees can be trained to do more useful work for the railway, while at the same time improving their own condition and opportunities for advancement, by making them the representatives of the company in all matters regarding which they may show themselves capable of acting for it.

At most railway stations the agent is the only resident representative of the company, and for that reason he frequently becomes charged with responsibilities beyond his power to act. It is the belief of the management of the Frisco that by making him in a larger sense a business man, with broad authority, in accordance with the practice of large business institutions in other lines, a good agent will be found capable of handling many matters that now require the attention of a superior office or a special representative.

The first part of the plan was put into effect last year, after the Frisco adopted the plan of transferring to the operating department the function of making settlements of claims. On August 1 the agents at all stations were authorized to pay from station funds claims for visible loss and damage in the case of both carload and less than carload freight, with certain exceptions, and within the limit of $50 for any one claim. This feature of the plan is no longer an experiment, but has so demonstrated its practicability and advantages that it is now regarded as a permanent arrangement, and at a recent conference of the heads of departments it was decided to extend its scope.

The Western division, comprising the lines from Tulsa to Avard, Okla., and from Beaumont Junction, Kan., to Vernon, Tex., including 62 stations, was selected for a further test of the plan of broadening the agent's authority beginning January 1. The station agents on this division were informed that they would be held responsible for all solicitation of traffic and for the proper handling of all claim matters, in addition to giving attention to other matters affecting the company's interests in their territory. Upon the success of the scheme on the Western division will depend whether it shall be extended to other parts of the line as well as how much its general scope shall be broadened in the direction of further increasing the agent's authority.

The purpose and scope of the plan were outlined in a letter by Vice-President W. C. Nixon, a copy of which was furnished to each station agent on the Western division, and the carrying out of the details was left to the superintendent of the division, who was authorized to increase the force at certain stations if necessary. The working of the entire scheme is under the general supervision of General Manager W. T. Tyler. The general superintendent and the divisoin superintendent made a trip over the division to explain the scheme to the agents and found that but a slight increase in force was necessary to enable them to perform the additional duties.

No changes in salaries were made at the start. The men were told that their salaries will depend on their own efforts, but that their condition as employees as well as their standing in the community will be materially improved, if they make the most of the opportunity, and that the company desires to make the importance of the position of agent greater than it has ever been before.

Attention was first given to the subject of securing business for the road. The territory of the different agents was clearly defined by the superintendent, special representatives of the traffic department, such as traveling freight and passenger agents were withdrawn and the agents were instructed to arrange their affairs so that they could do all the soliciting and other work necessary to secure the maximum amount of traffic tributary to the road in their territory. They were informed that they would be held responsible for securing a proper amount of this traffic as against competitors, and that they should not confine their solicitation of business to their own stations, but should visit inland towns and other points where there is a possibility of getting additional business without conflicting with adjoining agents. As an illustration, if an agent hears a neighbor or other member of the community is about to take a vacation or a business trip he is expected to call on him or meet him incidentally and urge him to travel by the Frisco, and assist him in planning the journey. If he hears that a merchant is planning to go to Chicago or St. Louis on a buying trip, he is expected to try to get the freight routed via the 'Frisco. He is expected to take time to scrutinize carefully the routing of all freight to see that the 'Frisco gets the long haul and the largest division of earnings.

In the handling of claim matters, it is believed that the station agents can perform a very useful function, as well as remove friction with local patrons of the road, by being empowered to settle small claims without delay and to expedite the settlement of all kinds of claims without tedious referring of papers from one office to another. They are given sufficient authority and facilities to enable them to settle with claimants for all stock killed on the right of way, and the claim adjusters that have heretofore handled such claims have been withdrawn. The agents are, therefore, the only ones left to handle this business, and will often be able to make a friend for the company of a farmer who might otherwise become permanently embittered against it by the delay and uncertainty in collecting the amount of his claim.

In settling claims on account of freight loss or damage, the agents conform to instructions which have now been in effect for six months, but which may be broadened in the future to cover kinds of claims which at first were considered too difficult for the agents to deal with. Agents are not charged with the duty of settling personal injury claims, except in specific cases under special instructions, but are expected to advise the proper office of developments in connection with such claims in their territory, and will be notified when they are expected to take action.

All claims on account of stock killed on the right of way, together with the reports of locomotive enginemen and section foremen in connection with them, are transmitted as heretofore to the district claim agent at Monett, Mo., who makes a record and a file of each claim and transmits the file to the proper station agent, who then endeavors to settle with the claimant in the same manner as did the stock claim adjuster. If the agent is able to come to an agreement for settlement with the claimant he immediately draws a draft on the treasurer, attaches it to the file, and sends the papers to the superintendent, who approves the draft and puts it in line for immediate payment. The file goes to the treasurer to support the draft when it reaches the treasurer through the agent's accounts. When the plan was first put into effect the agent filled out a form, had it signed by the claimant and witnessed, and sent it with all papers bearing on the claim to the district claim agent, who originated a voucher and passed the file to the claims' attorney for approval. The more direct method of allowing the superintendent to approve the draft at once was soon adopted to reduce red tape to a minimum and to carry out the company's purpose of completing the settlement with the claimant as quickly as possible. In case the agent is unable to reach a settlement with the claimant, or if the amount demanded by the claimant is higher than the agent thinks should be allowed, he sends the entire file to the superintendent with a full statement of the case. The superintendent may then use his discretion as to the settlement of the claim, and if in his judgment the amount demanded should be paid he returns the papers to the agent with authority for payment. If the superintendent deems the claim unreasonable, he refers the matter to the district claim agent, who either advises the agent that the claim should be declined or returns the file to the agent with instructions to have

the form filled out for payment. The instructions are that all stock claims should be settled as quickly as possible and with the least possible correspondence.

In addition to such regular functions as have been outlined, the superintendent is permitted to confer upon certain agents, within his discretion, such authority as he himself exercises in specific cases. For instance, if a community desires the opening of a highway across the right of way of the railway, an agent, who had shown himself capable, would be authorized to handle the negotiations to a conclusion without the delay of referring the case to the superintendent; and the same policy will be followed in other cases which a capable agent can handle as well as his superior.

The heads of the different departments, such as the traffic, auditing and claim departments, who have heretofore relied on special representatives for reports, now receive them direct from the agents, except in some instances in which it is deemed better to have the reports made through the superintendent.

Special attention has been given to impressing upon the agents that the company is depending upon them as its sole representatives in their respective localities, and that they have it in their power, in exerting a keen interest in the company's welfare, to better their own condition financially and otherwise. Mr. Nixon explained in his letter:

"The agents should understand that they are to handle the business of the company at their respective stations and in their territory as if they were the sole owners of the property, doing anything that, in their judgment, would be to the best interests of the company, not forgetting that courtesy and patience will be the largest factors in enabling them to establish themselves in a more important position than they have held in the past. They should be thoroughly impressed with the fact that they are now authorized and expected to take hold of any matter that needs attention, correcting anything that is wrong where it is possible for them to correct it, calling the attention of the head of the department in charge of the particular matter affected for assistance in making right that which is wrong, and they are to have no fear or hesitancy in criticising any action which works adversely to the interests of the company."

It is believed that the station agent, being a citizen, and frequently a prominent or well known member of his community, will be able to accomplish much better results both in soliciting business and in adjusting claims among his own acquaintances than a traveling solicitor or adjuster who is usually a stranger to those with whom he has to deal. It is also believed that giving the agent the authority to settle claims will give him an increased prestige among his fellow-citizens, and that the fact that he has been able to effect a satisfactory adjustment with an aggrieved patron of the road will frequently gain friends both for himself and for his company that will have its effect in assisting his efforts to get business.

The officers of the Frisco are enthusiastic over the success which has attended the plan of increasing the importance of the agent in the short time since its adoption, and especially over the interest manifested and the results accomplished by the agents. These have been particularly evident in the solicitation of traffic by the agents. There is no question in the minds of the officers that the plan will be extended as soon as possible over the entire system.

After a recent trip over the line by Vice-president W. C. Nixon and Vice-President W. B. Biddle, the latter in charge of the traffic department, the advantages of the scheme seemed to them so marked that instructions were given to the superintendents of other divisions to have their agents begin soliciting business even before the plan in its entirety is extended to their divisions. The superintendents were impressed with the fact that they have the same responsibility in connection with securing traffic as other officers, and that they are expected to see that the agents perform all duties required by the traffic department as well as by the auditing or transportation departments.

It has been found that requiring the agents to solicit traffic, interesting them in the work and giving them the time in which to do it, has an important effect in influencing the routing of freight in such a way as to give the local line the longest possible haul, thereby not only increasing earnings, but reducing the cost of handling by eliminating the transfers from car to car, or from train to train, which are incident to the handling of traffic by an unnatural route.

The Frisco has 20 or more traveling freight agents soliciting business along its lines. If the plan of making solicitors of the agents is carried out to its full extent these may be eliminated, and in their place the road will have 700 men soliciting freight and at the same time intensifying their efforts in their small territories in a way that would be impossible to the traveling solicitor.

Bringing the superintendents into closer touch with traffic and claim affairs is also said to have had beneficial effects, which have been manifested in an improvement in the condition in which freight is being delivered and a decrease in the number of freight claims, since the responsibility for the settlement of claims has been transferred to the operating department. A marked reduction has been noted in the number of claims for stock killed on the right-of-way, and inquiry elicited the information that fences are being kept in better repair and more care is being exercised by enginemen, section foremen and others since the matter has been brought to their attention.

The local newspapers have given wide publicity to the new departure, and patrons of the road are already becoming accustomed to taking up matters with the agents and having them promptly and satisfactorily adjusted, which formerly would have been taken up by correspondence or left unadjusted, with a consequent feeling of dissatisfaction on the part of the patrons. Many shippers along the line have expressed their approval of the plan which allows them to do business direct with those with whom they are acquainted.

The officers of the road have laid particular stress, in explaining to the agents the various features of the plan, on the importance of improving the relations between the company and the small or occasional shippers, pointing out that the agent is in most instances the only representative of the company with whom they come in contact and that on the courtesy and fairness which he displays in dealing with its patrons depends to a large extent the character of the public's attitude toward the railway.

FOREIGN RAILWAY NOTES.

The 24 o'clock system is to be adopted on the French railways for next summer's time tables. Inquiries as to the acceptability of the plan were sent to municipal bodies and chambers of commerce all over the country, and a great majority favored it. It has been in use in Italy for many years.

The Hungarian government recently granted to a London firm the preliminary concession for an important railway undertaking in Budapest. The line, which is of standard gage, and is known as the Szechenyi Railway, has a total length of about 40 miles, and traverses the mountainous district on the Buda side of the Danube river, which forms the principal summer resort for the inhabitants of Budapest. By a branch line the railway will connect with the state railways at Kelenfold, and by linking up with the existing Budapest-Estergon railway it will form a belt around the entire city. The passenger traffic is estimated at 15,000,000 per year, and it is stated that for the carriage of freight preliminary agreements have already been entered into which assure to the railway from its opening a minimum annual traffic of 400,000 tons. It is proposed to operate the line by electricity, and in this connection advantage will be taken of the opportunity to serve electric power to the villages served by the new line. While there are some very heavy cuts and viaducts, the line presents few engineering difficulties, and construction work will occupy a period of about 30 months. The total cost of the work, including rolling stock and equipment, is estimated at nearly $5,000,000, and it is expected that construction will be started some time during the summer of 1912.

THE BROKEN LEHIGH VALLEY RAIL.

The Interstate Commerce Commission has issued its report on the accident to a Lehigh Valley Railroad train at Manchester, N. J., on August 25, 1911, in which 29 people were killed and 62 injured, the accident having been caused by a broken rail. James E. Howard, of the Bureau of Standards at Washington, was engaged to investigate the cause of the rail failure, and his report is printed as an appendix to the report of the chief inspector for the commission, and from it the following abstract is made.

The rail was fractured on the north side of the track on which the train was running, abreast a crossover, a part of the train was precipitated from the opposite side of the track, the south side, to the bed of the creek, Canandaigua Outlet, from the plate-girder bridge spanning the creek. The fractured rail was several rail lengths east of Manchester station, the bridge several lengths east of the fractured rail in question.

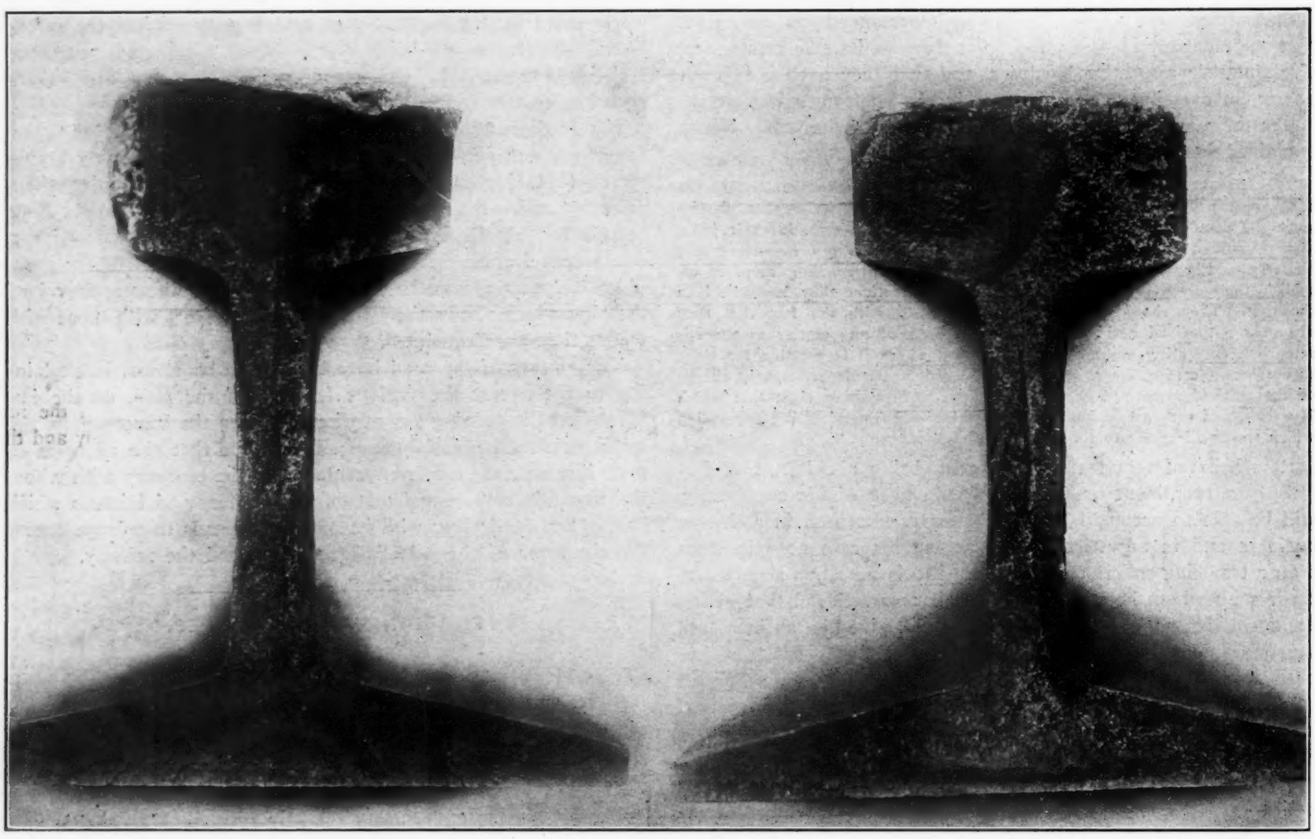


Fig. 1—End Views of One Fragment, Showing Appearance of Surfaces of Transverse Fissures.

The weights of the two locomotives which hauled the train were as follows:

Forward engine, No. 2476, Atlantic type, 196,500 lbs.

Second engine, No. 1804, ten-wheeler, 199,500 lbs.

The fractured rail was a 90-lb. American Society of Civil Engineers section, basic open-hearth steel, made by the Bethlehem Steel Company, 20 per cent. discard, rolled December 24, 1909. It was an A rail from the ingot. The steel was made on specifications calling for carbon content between 0.70 and 0.80 per cent. This rail was laid October 21, 1910, in the eastbound track, where it eventually fractured. Frogs were changed about April 20, 1911, at which time this rail was shortened by cutting off 6 ft. from its west end, reducing its length from 30 to 24 ft. Three new bolt holes for splice plates were drilled in the web at the time of cutting off.

This fractured rail exhibited two kinds of defects. It had a piped web, and in addition thereto it also displayed in the head a number of dark spots, which it should be said are light, silvery ones in certain fresh fractures. The surfaces of those spots are normal to the length of the rail. The specifications under which this rail was rolled required not less than 20 per cent. discard from the top of the ingot in order to secure sound steel. Notwithstanding this requirement, nor the mill, nor the track inspection, this rail got into the track, where it remained for a period of 10 months, until the time of this disaster. The specifications require shearing to continue if, after 20 per cent. discard, the metal does not appear to be solid, until it does. If the shearsman could judge of the defect in the steel which, when rolled, caused this split web the entire length of the A rail, then that requirement of the specifications was not met. If, on the other hand, his opportunity is not adequate to allow of the discovery of such defective steel, then the requirement has a perfunctory character, so far as pertains to the rolling mill.

The split web was visible on the ends of the several fragments which were available and examined. The split was also visible in the new hole drilled through the web alongside of one of the holes understood to have been drilled through the web at the time of putting in the new frog.

Under direct compressive stress the web was very strong, notwithstanding the presence of the split. A section of this rail 1 in. long sustained a load of compression applied on the running surface of a head of 75,420 lbs. This piece which was tested came from a fragment less than 2 ft. distant from the west end of the rail, as it existed at the time of the wreck, and represented therefore an unfavorable part of the rail. It displayed some toughness and opened along the seam in the web before final rupture.

Concerning the defects witnessed in the head of the rail, some have attributed the cause of these so-called defects to some unidentified and unknown reason connected with the process of manufacture of the steel. Expert testimony taken before the coroner states that the dark spots in question "indicate a decided defect in mill practice, but can't say positively what may have

caused it, but we can say that something in connection with the manufacture of that rail caused a separation of the metal at that point, constituting that defect," and more to the same effect. The manufacturers of the steel clearly take the same view as expressed in the testimony before the coroner, since it is understood that the Bethlehem Steel Company is at present engaged in a very energetic inquiry into the physical condition of their rails, but its inquiry has up to the present time developed no information nor clue to the formation of these defects, nor have such defects been found in any of the new and unused rails of its current manufacture.

The accessible fragments of the rail aggregated a length of about 12½ ft., a little more than half of the rail being present. Some 200 lbs. were said to be in the possession of the New York Public Service Commission, while some pieces were not recovered from the wreck. Pieces lettered D, E. F and section sawed from B were made available for examination and test, while the length marked H was forwarded to the bureau to supply further investigative material of the rail.

Piece A was the west end of the 24-ft. rail and length H the east end. A short fragment had been knocked off the east end of length H, after nicking with a cold chisel to furnish a sample for the New York Public Service Commission.

These fragments, shown in Fig. 2, are viewed from the gage side of the rail. The outer flange of the base of length H was broken off for a distance of 33 in. beginning at the westerly end of the same.

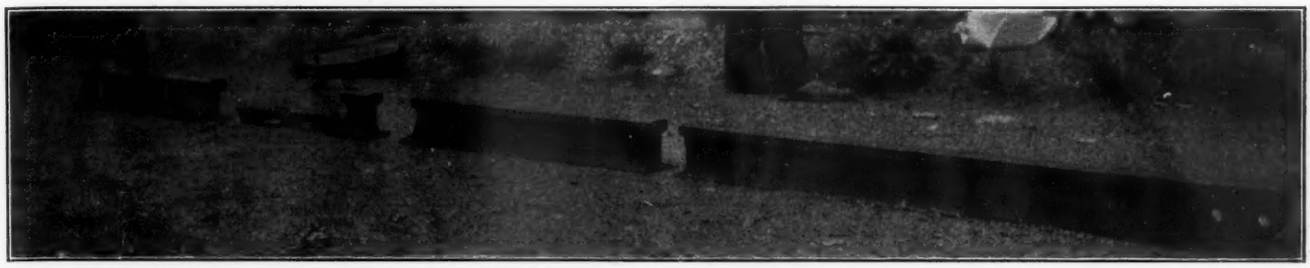


Fig. 2—Fragments of Rail.

In the report, these eight fragments are referred to by letter, A, B, C, etc., A being at the west end, i. e., at the left in the above view.

The west end of fragment G had a semicircular indentation near the center of the running surface of the head, made by a wheel flange striking the end of the fragment. Similar marks are shown on other fragments. The full length of the gap was not at one instant formed. The battered west ends of fragments D and E furnish evidence that the pounding of several trucks was withstood before the webs succumbed and the head broke off in short pieces.

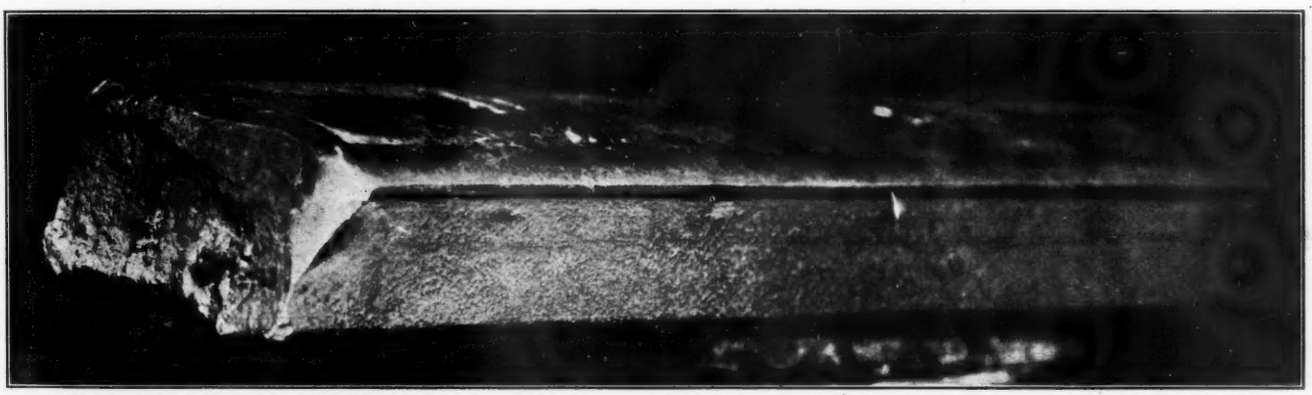


Fig. 3—Fragment D.

Two illustrations, Figs. 3 and 4, show the appearance of fragment D. The battered end, the left end in Fig. 3, indicates how severe were the blows received before it was detached from the

Fig. 4—Fragment D; Underside of Head; Lehigh Valley Rail.

Fig. 5—Location of Chips for Analysis; Fragment B.

Fig. 6—Fragment F.

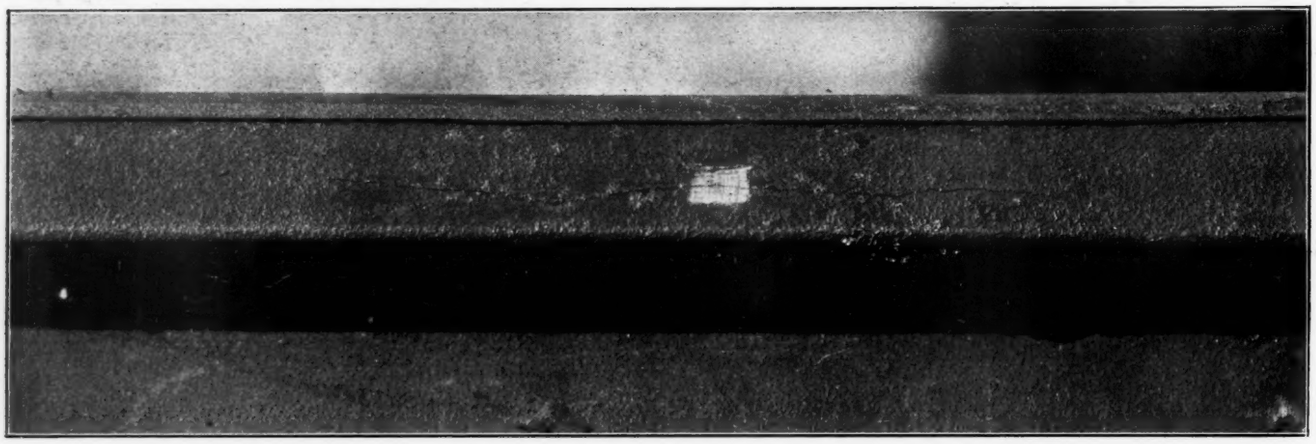


Fig. 7—Longitudinal Crack in Fragment H.

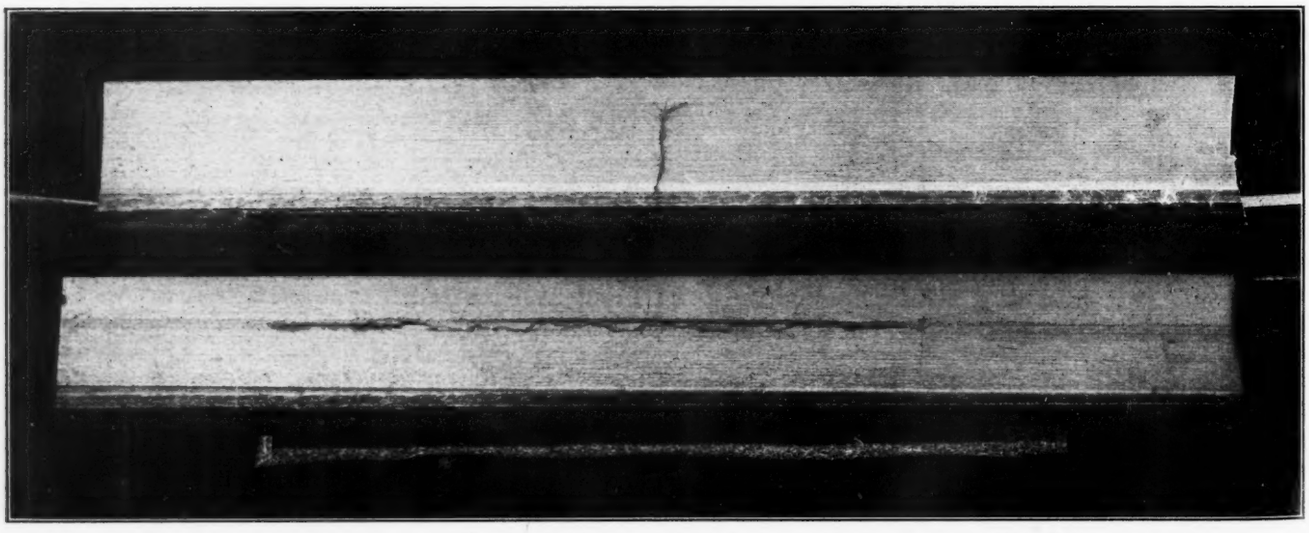


Fig. 8—Portions of Fragment H, Cut Apart Longitudinally by Vertical Cuts; Lehigh Valley Rail.

other part of the rail. Obviously this fragment could receive such a pounding only prior to its being detached from the part of the rail beyond. The fragment, as well as that marked E, was battered on its west end.

Fig. 4 shows fragment D from the underside of the head, and shows the split in the web in which was found a substance believed to be slag. It will be understood that this fragment was doubtless forced into the roadbed or against ties more or less covered with pieces of coal and other material. This remark is necessary to explain why material collected for chemical analysis from the web was in poor condition to show the original composition before the rail broke.

The analysis gave the following composition of this material in the split in the web:

SiO_2.	Al_2O_3.*	CaO.	MgO.	Not determined.†
Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
23.2	20.5	40.8	7.5	8.0

*Comprises Al_2O_3, Fe_2O_3, TiO_2, P_2O_5, Mn_3O_4.
†H_2O, CO_2, a little coal, perhaps SO_3 and alkalies.

From the above composition it is inferred that this slaglike material was rolled into the rail through the several passes down from the ingot, earlier coming from the ladle, and had its origin in the steel furnace.

Why there were a number of short fragments with ends very much battered and long fragments broken with less battered ends is a matter of speculative interest. The strength of the web, even with the split, was very great, as the test of a section 1 in. long showed. The heaviest wheel load is assumed to have been on the locomotives. It would seem to harmonize with the appearance of these short fragments to believe that the primitive fractures were caused by the locomotives; that one by one these short pieces were detached after some very severe pounding had been sustained; that the next in the order of events was the breaking of the longer pieces. Necessarily the spikes would in the meantime have been drawn more or less as the forward wheels of successive trucks struck these parts of the rails. The fissures existing in the head of the rail, as it is believed they did, and with loosened spikes would present a condition facilitating the further rupture of the rail in a brittle manner. It seems certain that no such resistance against the fracture of the rail was subsequently encountered by the train above that of the small fragments. The small fragments of the head being detached, as they were, from a middle part of the length of the rail, with a great display of resistance on their part against being detached from the web and base, called for a succession of heavy blows such as the locomotives would be capable of delivering rather than the coaches. It suggests that the destructiveness to the track was heightened by reason of there being two locomotives present.

When admitting steam, to get the train under headway would seem a critical period in regard to overstraining the track, more so in the case of a doubleheader and long train than in the case of a short one. Momentarily, the forward engineer being the one naturally first to admit steam or to accelerate the speed of the train, the train resistance would tend to overturn the forward locomotive, pull it over backward, relieve the pilot wheels of some load, and intensify the pressure on the drivers and therefore apply a maximum load to the rail.

As to the fiber stresses in the rail which would result from these two locomotives, coupled together in the usual manner, it cannot definitely be stated. Earlier tests of track have shown that the effect on the rail per ton of wheel load varies with different types of engine and with the different wheels of the same engine.

Those earlier tests showed still further that direct measurements in the track were essential for determining the fiber stresses in the rails—the wheel loads, tie spacing and moment of inertia of the rail section, constituting all the data available for such computation, not being adequate for the purpose. The depression of the roadbed so modifies the conditions that direct experiments in the track are required to furnish this information. The supply of information of this kind is very meager, and it is desirable that track tests be conducted to furnish data on present conditions, which may in some respects be more severe than those which pertained to track and equipment at the time the earlier tests were made.

The end of fragment B was drilled with groups of holes in six places, and the chips used for chemical analysis of the steel. The position of the holes are shown in Fig. 5, which is an end view of the rail after having been polished and etched with tincture of iodine.

The results of the chemical analysis were as follows:

Sample.	Carbon.	Sulphur.	Phosphorus.	Manganese.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
A (1).....	0.843 }	0.030	0.042	1.20
A (2).....	.829 }			
B.....	.831	.032	.044	....
C.....	.832	.035	.041	1.22
D.....	.867	.032	.044	....
E.....	.868	.035	.043	1.18
F.....	.829	.031	.040	....

It will be noted that samples D and E show the highest carbon to be located at the web and middle of the base.

There appears no material difference in the carbon content at A on the gage side of the head over that of C on the opposite side. While the metal at the running service of the head displayed greatest resistance against machine tools and sawing, it does not appear substantially different in carbon content than the sides of the head nor the metal near the edge of the flange. The markings of this etched section appear symmetrical in the metal of the head and show no characteristic difference between the two sides of the head. In this examination there is no evidence presented to show a difference between the metal on the gage side of the head, which, so far as observed, is the side which invariably displays the interior transverse fissures, and the opposite side of the head, which has not exhibited these fissures.

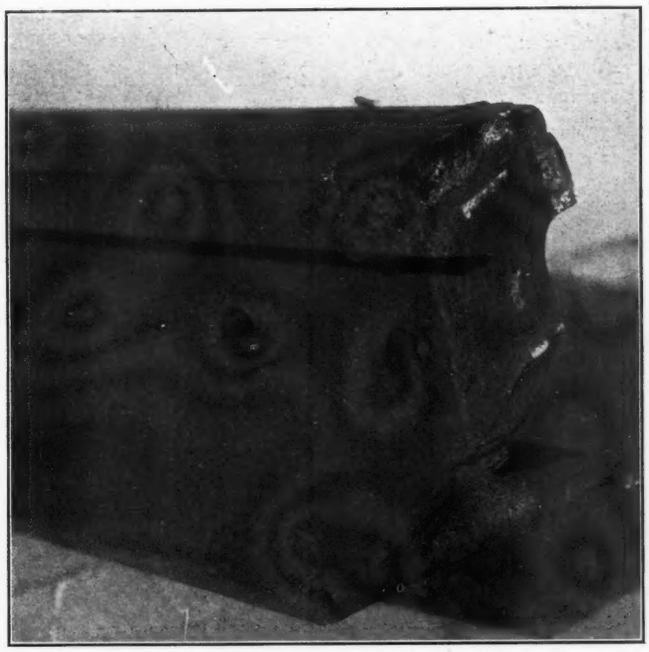


Fig. 9—Fragment H.

Showing longitudinal seam in head, made visible when rail was nicked with chisel and broken off.

The dark streak at the middle of the web in Fig. 5 represents the slag streak. There appears a faint line about halfway down the depth of the head and on the half of the gage side, the location of which is indicated on the print by a star. This line, about ½ in. long, represents a crack or fissure in the head, viewed on end; that is, a longitudinal crack the surface of which inclines downward toward the gage side of the head. This longitudinal crack was visible at each end of fragment B. It therefore appears that in the head of this rail are witnessed

both transverse and longitudinal cracks or fissures, each kind being found in the metal of the gage side or half of the head.

Fig. 6 shows the east end of fragment F. The west end of this piece was a sawed end. The presence of the surface of a transverse fissure on the gage side of the head is shown, also the split web. From the middle of the length of this fragment was taken the section 1 in. long which was tested by a load being applied on the head. The ultimate strength was 75,420 lbs., as previously stated, on the section 1 in. long by 0.58 in. thickness of web, or 130,000 lbs. per square inch. After passing the maximum stress the load sustained fluctuated for a time between 72,000 and 74,800 lbs., then fell rapidly, and when it had dropped to 45,600 lbs. the cracks in the web were developed.

The broken flange of fragment H was caused, it is believed, by the truck wheels getting across to the outside of the rail and with their flanges breaking off pieces of the outer flange of the rail. A longitudinal crack was found in the head of this fragment, the crack making its appearance on the gage side. Fig. 7 shows this crack about full size. The size of the head had been spotted with a chisel at the middle of the length of this seam before the photograph for this illustration was made. It was found that this longitudinal seam extended across the full width of the head and that it was associated with an interior transverse fissure near its west end.

At a place near the middle of the width of the head this seam was longer than at the surface at the gage side of the head. It measured 7¼ in. long near the center of the head. Following the seam toward the outside of the head, it came to the surface near the outside edge of the running surface of the head. That is, the seam viewed on a cross section of the rail would present an oblique line dipping toward the gage side of the head, a shearing direction with reference to a downward load on the head.

The head of the rail was split along the middle in a planer, bringing to view the interior part of this seam. The lower illustration in Fig. 8 shows it. A transverse seam, or fissure, is seen at the right end of the longitudinal seam, this being the west end of the latter.

Another transverse fissure was found in this fragment of the rail, the fissure being on the gage side or half of the head, as usual. This second fissure was located about 40 in. from the first, toward the east end of the rail. The upper illustration in Fig. 8 shows it, and it will be noted that the upper end of the fissure branches off longitudinally in each direction.

This fissure extended to the gage side of the head and could be seen on the rolled surface. While this was the case, the line of fracture being visible to the eye, still it was not sufficiently pronounced to attract ordinary observation. Its vagueness in appearance would cast doubt upon its identity if perchance its discovery had been made in the track. The crack may be seen on the side of the head, but it would be unreasonable to expect its discovery in the track except by accident. The detection of such fissures, or rather all such fissures if of frequent occurrence, would be a task practically too great to accomplish under service conditions. The insidious character of these fissures is a most disquieting feature of the case. Here are fissures of the most dangerous character which embrittle the rail and lead to fracture without display of ductility in the steel and which are so hidden as to practically defy detection under ordinary close scrutiny.

Fig. 10—Polished and Etched Cross Sections from Fragments B and F; Lehigh Valley Rail.

The obliquely inclined longitudinal seam at the east end of the rail in fragment H is shown in Fig. 9. A short section was sawed off the east end of this fragment, polished and etched with tincture of iodine. An obliquely inclined longitudinal seam was seen on end in the middle part of the gage side of the head, as well as the slag split, which was traced, so far as these fragments permitted, from end to end of this 24-ft. rail. On this and the other etched surfaces of this rail a satisfactory structure was exhibited and no indications were present of any material difference between the gage side and the outside of the head.

Fig. 10 shows two polished and etched cross sections of the rail in each of which appears an obliquely inclined longitudinal seam. The figure on the left is an end view of the piece from fragment B, while the figure on the right is from F, hence it appears that longitudinal seams as well as transverse fissures existed in several places in this rail.

Fig. 11 represents another rail, an E rail, it is said. This was a small triangular piece about 1½ in. long on the top of the head. The fracture was a fresh one and the fissure on the gage side of the head exhibited a silver luster. The oval boundary of the fissure is clearly shown by the illustration. The etched surface, only about 1 in. distant from the fissure, shows symmetrical markings and without suggestion of the development of a fissure so close at hand.

In cutting off the head from the web of fragment H in the planer the detached head sprung into a curved shape, with the running surface on the convex side. The deflection at the middle of the length of the piece, 5 ft. long, was 0.20 in. The deflection represented the release of internal strains of compression at the running surface of the head. This points out an important feature to consider in reference to the development of internal fissures such as were witnessed in this rail. The cold rolling of the running surface of the head of the rail by heavy wheel pressures has introduced internal strain in the steel at and for a short distance below the running surface. Those internal strains are of compression, and they reach their greatest intensity on the gage side of the head where flow of the steel takes place in a lateral direction. That lateral flow is shown by the ridge or fin of metal which was formed along the gage side of the head. When the rail is intact and the top surface or layer of metal of the head is in a state of initial compression, it follows that there must be an opposite strain of tension to balance it in some portion of the rail. The tensile component would be expected in the vicinity of and next below the part which was affected by compression strains, and this leads to an explanation of the presence of fissures in the head where they are being formed. No foreign substance in the steel is needed to account for the inception of those fissures. The introduction of internal strains in a hard and less ductile steel than heretofore used for rails, under excessive wheel pressures, seems adequate to explain the occurrence and frequency of these interior fissures.

The fissures, if this explanation of their origin is true, should not be found in new rails, unused, and it is understood that the steel company that rolled this particular rail has been unsuccessful in finding any such fissures in new rails, notwithstanding a very energetic effort has been made to discover them. These fissures are not held to be defects resulting from improper mill practice. They appear to be the result of excessive wheel pressures acting on a very hard steel, steel which is hard by reason of its chemical composition.

This development of internal fissures and seams, transverse and longitudinal, suggests that the limit of wheel pressures in conjunction with the bending and shearing stresses which occur simultaneously therewith has been reached and surpassed on rails of usual width and shape of head. The frequent occurrence of broken rails is a warning of this kind.

In the earlier days of steel rails softer and more ductile metal was used. The wheel pressures were lower then than they are at present. With increased wheel pressures harder steel was employed to give endurance to the rails. For a time it seemed that the metal of the rail was worn away by abrasive action about as fast as the immediate running surface of the head was affected by the cold rolling. The wheel pressures were not at that time so great as to disturb the steel in a serious manner at the head in the case of hard rails. Soft steel rails would flow under the increased wheel pressures and while the metal of the running surface of the head became very brittle in consequence of the cold flow, yet the ductility of the steel was adequate to prevent the formation of interior fissures in the zone of the head below the affected metal. Internal strains of compression were introduced the same then as now, but the toughness of the steel enabled it to endure such conditions without rupture.

There must be a limit in the combination of hard steel rails and high wheel pressures beyond which it is unsafe to go. Recent evidence indicates the approach to that limit in current railway practice, if it has not already been passed. It can hardly be a coincidence that all of the rails which are displaying these interior fissures have hidden structural defect on one side of the head and none on the other, and chance to be laid with the defective side on the gage side, where it is found. Evidence points to track conditions as accountable for the development of these fissures. They have been found as close together as 8 in. from one to another.

Progressive fractures have occurred in axles, but they started at the surface where the fiber stresses were greatest, and not at the interior where bending stresses would be very much less. The failure of axles by repeated stresses does not appear to furnish the same kind of an example as witnessed in the present rail fissures. The rail fissures have their origin or incipiency in the head at places where the stresses from bending loads on the rail would be not over 75 per cent. of the maximum fiber stress.

Some parts of the track are subjected to more severe conditions than other parts. Places where the stresses on the head from the wheel pressures are reversed in their direction would

Fig. 11—Transverse Fissure in Rail not Connected with Manchester Wreck.

afford examples of maximum severity. Such places are found where the trains stop and start at stations. It is important to ascertain what fiber stresses are developed in the rails under the wheels of locomotives of the present type. This part of the subject was experimentally inquired into some 15 years ago, since which the types of engines have greatly changed. It is quite important in view of these developments that information as to the fiber stresses be acquired for present track conditions, and such information can be acquired only on the rails when in the track, so materially does the depression of the roadbed affect the strains.

In conclusion, it is believed that present evidence points to the inference that the primary cause of the Manchester wreck was the formation and development of transverse fissures and longitudinal seams in the head of this rail which eventually fractured in the track, aided by the defective metal of the web. That the formation and development of the internal fissures is due to the

use of a hard steel and subjecting it to high-wheel pressures, wheel pressures which are excessive from a metallurgical point of view, thereby causing the development and introduction of internal strains, and those internal strains in turn together with the wheel loads caused the development of interior fissures, and their extension to a dangerous degree. That such interior and hidden fissures are a menace to the safety and lives of persons traveling over such rails.

That recent occurrences suggest the thought that current railway practice in the use of hard steel rails and high wheel pressures has nearly or quite reached the limit of endurance of the metal of the roadway.

That it is not a question of mill practice in the manufacture of the steel, further than that the mills are making the steel which they are required to make under the specifications given them.

That present developments are not inconsistent with what is known about the properties of steel in respect to the effects of intense local overstraining pressures of which high wheel pressures furnish one illustration, combined with high tensile, compressive and shearing stresses. In a way, it is a question of repeated stresses, but the number of repetitions of loading of this rail was comparatively small from its short time in service. It may be remarked that certain rail specifications require higher carbon steel as the weights of the sections increase, and also higher carbon steel for open-hearth rails than for Bessemer rails. In view of current developments, if the causes of formation of interior fissures are those herein described, then the employment of high-carbon metal is attended with dangers not apparently recognized in the drawing up of current specifications. It is desirable that measurements be made in the track of the fiber stresses which are caused by the new types and weights of locomotives in order to acquire necessary information to judge of the severity of the strains which the rails are being daily exposed to, information which is now lacking. Finally it may be said, referring specifically to the development of the short transverse fissures in the heads of the rails and which are found on the gage side of the head, that they are believed to constitute a grave danger. If, as now supposed, they are the direct result of high wheel pressures acting on hard steel, then the danger is widespread. The Manchester rail, omitting reference for the time being to the slag split in the web, was fissured in many places. Apparently a number of transverse seams and longitudinal fissures were developed in the track, as the result of a few months' service. The fissures occupied positions in harmony with the explanation of the cold rolling and shearing effect of high wheel pressures acting on a steel too hard to respond without the development of interior fractures. The effect was necessarily intensified by the bending stresses on the rail from the direct downward loads.

The limit of endurance of iron rails was reached long ago, Train loads and wheel pressures soon became too great for iron rails to stand up under and they were replaced by steel rails. There is undoubtedly a limit to the endurance of steel rails as well as in the case of iron. It is important to ascertain whether the great lesson of the Manchester disaster does not lie in the direction of signifying that the danger zone of steel rails has been reached and possibly entered into by current railroad practices. If the above explanation is found correct, then the remedy does not consist in increasing the weight of the rail, but in diminishing the intensity of the wheel pressures and lowering the direct compressive and the bending stresses.

While the Manchester rail was defective in the web the feature which seems most grave is the general shattering of the integrity of the rail, apparently coming from the combination of a hard steel and high wheel pressures.

Complete data is demanded by this inquiry into the causes which contribute toward this destruction of the structural integrity of the steel—data on track conditions, such as the actual fiber stresses which are realized under the weights of different types of locomotives and under the different wheels of those different engines in track in ordinary condition, and from the metallurgical end observations on steel of different degrees of hardness.

AGENTS' REQUISITIONS FOR STATIONERY.

BY A CLERK IN THE SUPERINTENDENT'S OFFICE.

Some kinds of material deteriorate if held for any length of time, or perhaps the material becomes obsolete and has to be scrapped with a great deal of loss. For stationery, there are much the same reasons for keeping down the stock that exist with respect to other kinds of material. While it "won't spoil," as an agent is quoted as saying in answer to a query about excess stock, at the same time the constant changing of forms often finds the agents with a large stock on hand of some form made obsolete, with a corresponding loss.

Some of the railways are now working for reform in handling stationery requisitions. One large road has devised a system by which the persons making requisitions first make up an estimate of their requirements. This estimate is then checked against by the offices through which the requisitions pass. If an item on the requisition is in excess of the amount called for on the estimate, the question is taken up as to the necessity for the increased amount. But this system is almost worthless for very obvious reasons. In the first place, the estimates are usually made rather high in order to avoid the trouble of constantly changing them. In many cases the estimate calls for twice the number of blanks normally consumed.

Restricting the subject to agents only, we find that the greatest cause of carrying excess stock of stationery is carelessness in ordering. Too many of the agents, instead of checking their stock carefully before making up their requisitions, place the estimate before them and make up their requisitions for the most part from it, occasionally looking at their stock, but making no careful check; for some items, in fact, not looking at their stock at all, but making a guess at it. In cases where a man is ordering double what he needs because it is on the estimate, the checking done in the various offices through which the requisition passes reveals nothing wrong. The result is that often there accumulates from two to four times as much of certain kinds of supplies as is needed. It would seem that some of the agents get into a habit of ordering a fixed amount of certain items each requisition period. For example, at one small agency, when inspection of supplies was made, there was found six quarts of ink, enough to last the agent for two years. He had been ordering a quart bottle of ink at each requisition period for some time.

What measures can be taken to improve conditions in regard to ordering of stationery by agents? I think a form could be made up for the use of agents in keeping a record of stock and ordering stationery which would give excellent results. This form should show the amount on hand of the different forms and supplies, and the amount ordered. The heading of the blank could be somewhat as follows:

Form number and description.	January 1.		April 1.		July 1.		October 1.	
	On hand.	Ordered.	On hand.	Ordered.	On hand.	Ordered.	On hand.	Ordered.

As was said before, carelessness in not properly checking the stock on hand before ordering is the greatest source of trouble. This form, properly followed out, would eliminate this source of trouble. Inspections could be made by division people to see that the record is properly kept up. There would be practically no additional labor by following this practice, as it is axiomatic that to do a thing right saves time in the end.

In regard to checking the agents' requisitions, a word may be said. On one large railway these requisitions are checked three times after being made. No doubt as good results could be obtained if the requisitions were checked once, properly, by division people acquainted with local conditions, and the expense and delay of checking the requisitions a second and third time could be eliminated.

EFFICIENCY COMMITTEES ON THE CHICAGO & NORTH WESTERN.

From time to time the *Railway Age Gazette* has described the organization and methods of the safety committees formed on the Chicago & North Western and other railways for the purpose of providing a means for obtaining better co-operation between managements and employees in reducing accidents. The North Western was the first railway to adopt the safety committee plan; and after this had been in use long enough to demonstrate its value it was decided early in 1911 to adopt similar measures in the effort to increase efficiency. The efficiency committee plan has now been in effect for several months, and it is believed a description of some features of its workings will be of interest.

One result of the safety campaign was to disclose the important part played in causing accidents by minor details, and to show the advantage of having a body of men constituted for the purpose of detecting and correcting the little things that cause trouble. The organization of the efficiency committees was suggested by the idea that a committee appointed for the purpose could find many ways in which efficiency could be increased in addition to providing a natural channel through which meritorious suggestions from all sources might be investigated and brought to the attention of the proper authority to secure the necessary action.

As in the safety committee plan, one of the chief objects was to enlist the interest and co-operation of the employees; and to this end the form of organization and the methods that had proved successful in the safety campaign were adopted. A central efficiency committee composed of general officers, and corresponding to the central safety committee, was appointed, and division efficiency committees consisting of both officers and employees were formed on every division.

The Central Efficiency Committee is composed of W. E. Morse, assistant general manager; S. G. Strickland, general superintendent; Robert Quayle, superintendent of motive power and machinery; C. A. Schroyer, superintendent of the car department; E. E. Betts, superintendent of transportation; W. J. Towne, engineer of maintenance; William Bennett, superintendent of telegraph; H. C. Howe, freight claim agent, and J. W. Branch, auditor of collection accounts; and the division committees include the superintendent, assistant superintendent, trainmaster, master mechanic, division engineer and a roadmaster, conductor, locomotive engineer, fireman, brakeman, switchman or yardmaster, and a station agent.

Under the direction of the division committees monthly division general meetings of the employees are held, at which subjects pertaining to efficiency, economy and the general betterment of the service are discussed. A record of the meetings is kept to be reviewed and considered at meetings held quarterly by the division committees. Such matters as pertain to a division itself and come within the jurisdiction of the superintendent are disposed of at these committee meetings, while those that involve questions of general policy and require authority or reference are submitted in a formal report to the central committee for disposition. All suggestions requiring central committee approval must be accompanied by the recommendation of the division committee; thus suggestions found to be impracticable or without merit are eliminated after having been considered from the point of view of the representatives of the various departments in the division meetings.

At the general meetings the attempt is made to obtain the attendance of as many employees from each department as possible and to induce them to present their views and any suggestions that occur to them. Every effort is made to impress upon employees the fact of their common interest with the management in the improvement of the service; that their ideas and suggestions are of the greatest value to the management in the efforts to reduce the difficulties met in rendering the service; and that by the development of observation and the cultivation of thought upon the subjects of efficiency and economy they may assist materially to operate the railway in the most efficient and satisfactory manner from the viewpoint of owners, patrons and employees.

Some of the topics to be discussed at the general meetings are referred to special sub-committees for investigation; and reports are made which are presented at the general meetings for free and full discussion before final action is taken by the division committee. From time to time the Central committee suggests subjects and presents statements and statistics to the division committees for consideration.

The Central committee meets quarterly to consider and take action on the recommendations of the division committees. Occasionally, a recommendation is referred back to the committee with which it originated, or to a special sub-committee for further investigation, while recommendations approved by the Central committee are referred to the management or ordered put into effect by the member of the committee having jurisdiction over the matter. As often as possible some member of the Central committee meets with the division committees.

Experience has shown that while many impracticable schemes are submitted to the committees by members or employees, many exceedingly valuable suggestions are made on matters which have heretofore been neglected, because no particular officer or employee was in a position to observe them or to take action regarding them in a comprehensive and effective manner. It is believed, however, that the plan has its most important result in stimulating in both officers and men a habit of constant watchfulness for methods of improving the efficiency of operation and maintenance.

As an example of some of the methods pursued and the results accomplished by the efficiency committees the work of a special committee appointed to make an investigation of the question of coal efficiency on the Galena division may be cited. At a recent meeting of this committee it was reported that not only had several conditions which had led to waste of fuel been discovered and overcome, but that more interest had been manifested on the part of men in all departments by reason of the concentrated efforts to reduce the consumption of coal and the expense of handling it, and that a saving of 10 to 15 per cent. had been made in December, 1911, as compared with December, 1910.

In December, 1911, as compared with November, 1911, there was an increase of 2,000,000 in tons hauled one mile on the Galena division, or 1 per cent., while the coal consumption was reduced 2,000 tons, or 7 per cent. There was an increase of 19,000 passenger car miles, or 1.6 per cent., while the coal consumption in passenger service was decreased 1,000 tons, or 7 per cent., making a total saving of 3,000 tons of coal in one month, with an increase of over 2 per cent. in freight ton and passenger car miles. For instance, it was discovered that the box front and spark arresters on the locomotives as applied were causing an excessive consumption of coal. After certain changes had been made by the mechanical department it was found that a saving of as much as one ton per 100 engine miles, had been secured.

By better supervision of the care of engines necessarily standing out of doors on account of inadequate roundhouse facilities, the mechanical department was enabled to effect a saving of about 8 tons every 24 hours, or 240 tons per month, in the coal necessary to keep these engines alive.

Experiments in the firing of engines at roundhouses made practicable a saving of 400 lbs. per engine for 92 engines per day, or a total saving of 18½ tons per day. This was accomplished by enlisting the interest of the roundhouse forces, by the use of a cover for the stack while the engine is in the roundhouse, thereby conserving the draft on the fire, and also by not having engines fired up until they were ordered, except in a few emergency cases, and by the exercise of more caution on the

part of the operating department to avoid ordering engines an unnecessary length of time before they were needed. The committee believes that as the work progresses a further economy can be effected in the consumption of coal required in firing up engines.

Especial attention was devoted to reducing the cost of handling coal at the coal houses. At one point this cost was reduced from 22 cents to 11 cents per ton by having the wiper instead of the section men coal the engines. At another coaling point where it had been costing 6½ cents per ton to handle coal, a bid was received from a contractor to do the work for 5½ cents a ton, which covers the cost of coaling engines and picking up the coal around the track. At another point it was found that because of the location of the pump and the coal shed it had been costing $75 a year to haul down to the pumping station. An investigation was ordered of the question of locating a pumping station near the coal shed.

The coal efficiency committee also came to the conclusion that continued progress in economy in fuel expenditures could be obtained by some expenditures for more adequate roundhouse facilities, for the installation of hot water plants with which to wash out locomotives, and for additional passing tracks to improve the train movement, and the management was informed that if desired the committee would prepare specific recommendations along these lines.

A further illustration of the character of subjects handled by the committees will be afforded by the following examples of recommendations passed on by the Central committee at a recent meeting.

One division committee recommended that rails be loaded in flat cars for transportation from the mills. The Central committee found that in a few instances rails had been loaded in steel gondolas of 100,000 lbs. capacity, and recommended that this be discontinued so far as possible, but decided it was impracticable to furnish flat cars invariably for this purpose, because it is impossible to provide sufficient flat cars, and because it was believed the empty car mileage that would result would more than offset the economy in unloading the rails.

Another division committee recommended that green lumber be not used in repairing cars, because when it dries out it leaves openings and makes the cars defective. The Central committee referred the matter to the management for investigation of the quality of flooring and siding now used. One division committee also recommended that only regular horse cars be used for handling horses. Recommendations were made to the management that a number of stock cars be provided with slats close together and more securely applied for a distance of about 4 ft. from the floor of the car. Another recommendation of the same division committee was adopted, that so far as possible stock cars be used for handling oil.

One division recommended that a merit system be established locally in each large freight house and that bulletins be posted showing the standing of employees as to efficiency, etc. The Central committee was not of the opinion that this plan would be practicable in general, but agreed to bring the matter to the attention of those in charge of some of the principal freight houses for consideration. The same division committee recommended that speed recorders be placed on all passenger engines. The Central committee rejected this recommendation on the ground that the company's experience with speed recorders had not demonstrated any marked increase in efficiency or economy.

A recommendation that more care be exercised in the loading of coal at the mines to avoid rubbish being mixed with the coal was referred to the superintendent of the mines for attention. It was the opinion of the Central committee that this was probably due to the rubbish not being cleaned out of the cars.

A division committee recommended a restriction of the practice of calling upon assistant superintendents, road foremen of engines and trainmasters, to ride on special trains or trains carrying extra equipment or business cars, saying that the practice has been carried to extremes and takes these officers away from their duties. The Central committee referred the recommendation, with approval, to the management, and orders were issued to minimize the practice as much as possible. A division committee found that the lack or the poor condition of water at several points on the division had been causing many delays. An investigation by the Central committee led to the remedying of the conditions. Another committee recommended that the rear trainman be designated as trainman instead of flagman. The Central committee after consideration decided that as the flagman's most important duty is to protect trains, both employees and the public should be allowed to recognize him as a flagman first, and a trainman afterward.

A division committee recommended that more attention be given to the question of properly repairing lanterns, because the men were inclined to be careless with repaired lanterns. As a result the practice was established of carefully overhauling all repaired lanterns, removing the dents and redipping the lantern frames, before redistributing them.

A division committee recommended the adoption of some methods of weighing and charging out coal to enginemen, and that statistical figures showing performance per unit be posted on bulletin boards. This matter was taken under advisement. The recommendation of another committee that more supervision be given to preventing theft of coal was returned to it with a request for specific recommendations as to the methods to be adopted.

A recommendation that time card folders be destroyed after the reprint of time cards was referred to the passenger department.

One of the division committees reported that placards on cars containing explosives were frequently being placed near the bottom of the door in violation of the rules, and that the practice was dangerous because boys often use the placards as targets, and in shooting low at the card near the bottom of the door are liable to hit a box of high explosives. The Central committee recommended that superintendents issue instructions to their agents to have the cards placed above the loading line of the cars.

Many other valuable suggestions have been made by the division committees, and either approved and acted on by the Central committee or referred for special investigation. In other instances plans that have been suggested will be tried out in an experimental way on a small scale.

An important feature of the plan is that by having employees as well as officers on the division committees other employees are encouraged to offer suggestions which may be valuable, as they feel more free to make such suggestions to their fellow employees than to their superior officers. The plan of holding general meetings of employees also brings out many ideas from the rank and file.

A great deal of construction work is under way and a large amount contemplated by the Prussian state railways. New stations are being erected, grade crossings being eliminated, new tracks being laid, etc., all over Germany. The government is laying new tracks and widening the right of way through the Rhine valley so as to shorten the route between Cologne and Berlin. This entails a tremendous amount of labor, owing to the numerous heavy cuts and fills. The valley is narrow, the sides comparatively steep, and no room can be wasted, as the towns and cities of Vohwinkle, Elberfeld, Barmen, Schwelm and Hagen lie close together in the valley. Drag scrapers are not adaptable to the work here on account of the rocky nature of the soil, but wheelbarrows and dump cars are extensively used. Near Cologne where a number of tracks are being raised for several miles, and where the soil is sandy so that drag and wheel scrapers could be used to advantage, none are to be seen. Small cars are being used which are either loaded by hand or by small steam shovels.

Maintenance of Way Section.

ELEVEN kinks were submitted by five contributors to the Track Kink Contest, which closed on January 25, eight of which have been accepted and will be published in this and succeeding issues. The judges of the contest were L. C. Hartley, chief engineer Chicago & Eastern Illinois; H. M. Eicholtz, assistant superintendent Chicago & North Western, and D. W. Thrower, roadmaster Illinois Central. They awarded first prize to A. M. Clough, supervisor New York Central & Hudson River, Batavia, N. Y., on his contribution on "Handling Snow and Ice with a Spreader," and second prize to P. H. Hamilton for a description of a method of squaring up the head of a spike maul. Other contributors were J. L. Taylor, assistant engineer Grand Rapids & Indiana, Ft. Wayne, Ind.; F. M. Patterson, assistant engineer Chicago, Burlington & Quincy, Chicago, and P. J. Keenan, supervisor Erie, Cuba, N. Y.

THE educational value of the annual exhibit of the Railway Appliances Association, which will be held at the Coliseum, Chicago, the week of the annual meeting of the American Railway Engineering Association, March 18-23, inclusive, is well recognized by those in charge of the maintenance departments, and their attendance in past years has been large. There is a rapidly growing realization of the value of this exhibit not only to the heads of maintenance departments, but to their subordinates; and the number of division engineers, roadmasters and supervisors attending is increasing each year. On most roads, the men near Chicago, at least, are urged to attend; and men are coming each year from greater distances. In many instances the section foreman can visit the exhibit to excellent advantage. One road sent all its supervisors and foremen to spend a half day each at the exhibit last year and plans to do so again this year. A roadmaster near Kansas City let two of his foremen attend the exhibit last year, and was so pleased with the results that he will send two other foremen this year. No other exhibit affords the same opportunity for railway maintenance men to study new and standard devices, and every one interested in this branch of work should visit it and take sufficient time to study those features of concern to him.

AT this season when estimates and allotments of ballast required for the coming season are being prepared the question of widening banks is most timely. The tendency in recent years has been to build wider banks on new lines, and a number of roads are also making a systematic effort to widen old banks. The heavy motive power now in use has made this necessary, and the saving in track labor that results justifies the expense. The width of the bank necessary varies with the kind of material of which it is composed, the character of the ground and the height of the fill, as well as with the weight of motive power. A phase of the bank widening problem not always considered is the saving made in the amount of ballast necessary as compared with that needed for a narrower bank. Some ballast rolls down the slope on a narrow bank and a larger amount is required to maintain the necessary shoulder. Also when ballast extends practically to the shoulder of the sub-grade it is less effective in distributing the pressure on the embankment proper. On track already ballasted the bank can be readily widened with small loss of ballast by casting the ballast from the shoulder into the center of the track before unloading any dirt. After the bank has been built up to the proper height and width the ballast can be replaced and will usually give a wider shoulder than before because some of this material previously formed a part of the sub-grade. When one considers that in most cases three or four yards of filling can be placed for the cost of one yard of common ballast, and five or six yards for one of rock or other more expensive material it is readily seen that a large amount of bank widening is economical when first cost alone is considered. In many cases the money now spent for ballast can be materially reduced and permanent benefits secured by doing more bank widening and using less ballast. In widening banks only sand, gravel or other porous material should be used. Any impervious material will hold water in the old bank, which must be carefully avoided. However, there are usually sand or gravel pits adjacent, from which material can be secured which would be satisfactory for bank widening, although not for ballast.

THE necessity for thorough drainage in a yard is well illustrated by a recent experience with the tiling in a large yard. This was a hump yard built within the past two years and had not previously been tiled. The bank became so saturated with water that it rose to the level of the bottom of the ties and drainage became absolutely necessary. Two lines of tile were laid across the yard at right angles to the tracks, the first of 8-in. tile near the foot of the grade, and the second of 12-in. tile about 1,000 ft. below the first. Practically no water entered the 8-in. tile at the upper end, but it ran full at the lower end for 36 hours continuously after installation and has since run partially full. A small amount of water entered the upper end of the 12-in. tile, while the lower end ran full for some time and has since run partially full. The water fell from the base of the ties until now the entire yard is comparatively dry. No further evidence is necessary to demonstrate the economy of this tiling. Although it is not known whether a drainage system was originally planned in this instance, such a system is generally included in the plans for large yards. Probably, however, there is no important feature which is so often omitted in the actual construction. Such omission is usually not made intentionally, but so many additional facilities not provided for in the original plans are considered necessary by different officers that the cost is materially increased and the engineer is forced to eliminate all expenses not absolutely necessary to keep within the authorized expenditure. After the yard is put in service the question of drainage is pushed aside from year to year by other demands which seem more urgent. In spite of the fact that it would be economy to put in a drainage system and thereby reduce maintenance cost, yards frequently go undrained for many years.

WHAT are you doing to provide a future supply of section foremen? Have you enough competent men in view to fill your vacancies within the next few years, and are you planning on allowing your successor to secure his men as best he can? These are questions that present themselves forcibly to roadmasters and supervisors; for the most serious problem in the track department is the foreman problem. That roadmasters and supervisors seldom know where they can secure foremen to fill vacancies is a universal complaint. Incidentally, how are the railways providing for their future supply of roadmasters? Instances frequently occur where men are promoted around a roadmaster because there seems to be no suitable man to replace him. What is the cause of this general condition? Is it an inevitable one, resulting from the rapid economic development of the country, or is it arising because of previous mismanagement and lack of foresight? If the result of economic changes, what measures must be taken to adjust matters properly to meet the new conditions? If caused by lack of foresight in the past, what is the best way to recover the ground already lost? Some men believe the foreign foreman is the only solution. Others believe the best results will be obtained by an increase in wages sufficient to attract sufficient men of American birth to fill the foremen's positions. Still others believe the best results can be obtained by training and educating the foreign and inferior native laborer until he shall become proficient enough to

properly perform the section foreman's duties. "The Foreman Problem—How to Provide a Supply for the Future," will be the subject of the next contest in this section, which will close March 25. The question is primarily an economic one, true efficiency requires that increased results shall be secured in proportion to any increase of expense due to raises of wages or the adoption of educational features. Only a few roads have attacked this problem in a systematic way, although many plans for its solution have been used locally on single divisions. If these local experiments have worked out successfully they may be capable of wider application. We desire that the contributions to this contest be as complete and representative as possible in order that the greatest benefit and the most practical results may be secured. Many have given the subject a great deal of careful study and the results of their study and experience should be valuable to others. A first prize of $25 and a second prize of $15 will be awarded for the two best papers received, and all others accepted and published will be paid for at our regular space rates. All contributions must be in the hands of the civil engineering editor of the *Railway Age Gazette*, 417 South Dearborn street, Chicago, not later than March 25.

CREOSOTE OIL SPECIFICATIONS.

At the convention of the Wood Preservers' Association in Chicago last month two papers on creosote oil specifications were read, which presented clearly the differences of opinion which exist on that subject. The paper by Hermann von Schrenck, published in the *Railway Age Gazette* of January 19, defends the American Railway Engineering Association specification as a high standard to which all consumers should strive to buy, making allowance for inferior grades by the use of larger quantities. This attitude is typical of a number of railway men and other consumers of creosote oil who are anxious to improve its quality. The paper by S. R. Church, published in this issue, advocates a modification of this specification on the ground, first, that consumers are not justified from a theoretical standpoint in demanding as high boiling an oil as it requires, and, second, that the requirements are unreasonably high from a commercial standpoint. This is the opinion of most of the American manufacturers of creosote oil and some of the consumers.

For the purpose of discussing the specification as intended for treating timber for railway companies, satisfactory creosote oil may be said to have two requisites; first, it must be antiseptic, and second, it must be stable, that is, evaporate slowly. Mr. von Schrenck admits that for practical purposes all parts of creosote oil may be considered antiseptic enough to prevent decay, and Mr. Church presents records of tests to prove that any difference in antiseptic value is in favor of the middle portions of the oil as compared with the high boiling fractions. Mr. Church admits that, other things being equal, the lower boiling fractions evaporate more rapidly, and Mr. von Schrenck cites considerable evidence to show the amount of this difference in rate of evaporation. Mr. von Schrenck recognizes the commercial difficulty which the producer has in controlling the composition of creosote oil, and Mr. Church characterizes it as a "by-product of a by-product," implying that it should not be subject to rigid specifications.

Since the beginning of timber treating on a commercial scale in this country the oil available from American producers has never equalled the demand, and this shortage has increased rapidly in recent years until at present more than 70 per cent. of the oil used is imported.

The production of coal tar from American beehive and by-product coke ovens is more than sufficient to supply all the creosote oil needed in the United States, but it cannot all be distilled, since the pitch so produced would not all be salable. The demand for pitch, therefore, limits the production of creosote. This economic condition is very important in considering methods of securing high grade oil. Theoretically, since the high boiling oils are the more stable, and therefore better suited for use in wood preservation, consumers should demand such oils and refuse to pay as high a rate for inferior grades. Practically, it is doubtful if the total production of oil meeting A. R. E. A. specifications in the United States, and the portion of that produced abroad which is available for export to the United States, are equal to the demand in this country. It is obvious that a producer of oil falling short of the requirements of the specification can market his product at the current price for the best grade if competition with that grade is eliminated by a shortage in its production. It has not been demonstrated that a consistent demand for standard A. R. E. A. specification creosote will not stimulate the production of such oil to an amount equal to the demand.

While the control of the composition of the oil to meet certain requirements may involve an added expense in its production by some companies, this added cost to American consumers should not be as great as the item of transportation cost on imported oils, and therefore no hardship would be worked on domestic producers in demanding a high boiling oil. If in the development of the industry it should become necessary to pay a premium for oil meeting the specifications it would be impossible to determine from existing data how much could economically be spent to secure such oil in preference to a slightly inferior grade. It is easy to show by pan tests and by examination of the oil remaining in treated timber that the lighter low boiling fractions evaporate more rapidly than the higher boiling fractions, but the extent to which evaporation of oil from a piece of timber decreases its life is not known. It would seem, then, that until more complete data on the life of timber treated with oil meeting A. R. E. A. specifications is available consumers should not be arbitrary in demanding a product which meets that specification exactly, but, on the other hand, considerable oil is now being sold containing such low boiling fractions that there is no doubt of its inferiority, and by taking such oil consumers are not doing what they can to improve the quality of the American product.

A COMBINED MAINTENANCE ORGANIZATION.

The experiment being made by the Union Pacific, of maintaining automatic signals on one double-track district in Nebraska by the regular track forces, which was described in the *Railway Age Gazette* of September 15, 1911, has brought out a good deal of discussion. The question has frequently been raised whether this combination of maintenance work cannot be carried still further with good results. It will readily be admitted that the present highly divided method of handling maintenance leaves much to be desired. Its defects are well known. Any means by which many of them can be remedied without causing others equally objectionable would be valuable.

The existing maintenance organization on nearly all roads is commonly divided between the track, bridge, signal and telegraph departments, and on some roads is divided still further. This division of forces, each portion of which reports at least partially to a different officer, has a tendency to create a departmental spirit, which results in loss of co-operation. The more highly specialized any department becomes the less is the degree of co-operation secured with other departments. Persons in such a department sometimes seem to forget that the main business of a railway is to produce transportation, and that all branches of the service exist to further this main purpose. While the field of maintenance has broadened rapidly within recent years to cover properly new and diversified duties, the work of the different branches is so closely related that the greatest co-operation possible between them is desirable.

On automatic signal territory a signal maintainer must be on hand to bond rails promptly when a track gang changes them out. A bridge gang must be on hand to raise a trestle when the track forces are ballasting on either side. The section men must help the telegraph linemen carry a pole to the place where it is

needed to replace a broken one. Again, much work is now being done by other branches of the service which could be done equally well and with a great saving in cost by the regular track forces already on the ground if they were properly instructed. A man from the building department is sent from distant headquarters to replace a plank in a depot platform or to put a pane of glass in a window. The bride gang is sent out to unload a car of material in advance of the actual construction work in order to release the car, and the telegraph line man comes out to repair a broken wire. A section foreman of ordinary intelligence can do these things as well as the men from the different branches of the service, and eliminate the time now lost by them in traveling to and from the work and waiting for trains, which very frequently much exceeds the amount of time that is actually spent on the work.

It will very probably not be possible or practical to combine all the work of the different maintenance branches into one department, but it would appear to be practical to so combine most of it. One would not expect any average foreman to direct the work of renewing a steel bridge or to rebuild an interlocking plant, for these would under any form of organization require the attention of an officer above the rank of foreman. Consolidation of much of the work would not interfere with the more complicated or technical work being done by the individual branches.

There is now a large amount of duplication in inspection. The track foreman goes over his track carefully every day; the signal maintainer does likewise, while the telegraph and bridge men make frequent trips over the territory. This frequent inspection could all be done by one force; in fact, often now the track and signal maintainer each inspects a portion of the line each day for the other.

The most common objection to the proposal to combine maintenance forces is doubt as to the ability of the average foreman of either branch to familiarize himself with the work of the other branches. The Union Pacific found that within a few months after signal and track maintenance were combined as satisfactory results were being secured as before with separate forces. Consolidation of forces would make it practicable to put the best men in each branch of the department in charge of gangs located where the work with which they were most familiar predominated; for example, to put the signal maintainer in charge of the gang where signal work was particularly important, etc. It would be necessary and possible to pay higher wages to these better foremen, which would make the work more attractive, enabling a still better class of foremen to be secured. The railways now find it necessary to pay relatively high wages to get enough competent men for their bridge and signal gangs; and one or two men of this higher-paid class could be given to each foreman with the idea that they would develop into capable assistants. On many roads the different branches of maintenance work are grouped under the supervision of the division engineer; and there seems no good reason why the same principle could not be extended lower down by grouping them all under the roadmaster, also.

NEW BOOKS.

Dredges and Dredging. By Charles Prelini, Professor of Civil Engineering, Manhattan College, New York. D. Van Nostrand Company, New York. 6 in. x 9 in. 279 pages. 82 illustrations. Cloth binding. Price, $3.

This treatment of dredges and dredging by Charles Prelini is intended to present in concrete form the accumulated experience of engineers on this very practical subject. The work of excavating either in the dry or under water is one which many men feel competent to handle, but the economical carrying out of such work is fully as difficult as the more technical phases of engineering construction. The description of dredges and organizations for handling dredging, together with the definite cost data which is included, should prove valuable to men interested in this work.

Letters to the Editor.

TURNOUTS.

CHICAGO, Ill., January 19, 1912.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

The article in your issue of December 15 abstracted from Bulletin 139 of the American Railway Engineering Association, on "The Turnout," written by F. S. Stevens, is a very valuable contribution to the subject, and will be of much help in clearing the way for standard frog and switch practice.

The various features of a turnout are a matter of continual improvement. This improvement has been going on since the first railway was built, and will probably continue until we reach the maximum weight of rail that it is economical to roll and operate over. The necessity for improved turnouts becomes more manifest, as engines and cars are made heavier and as speed becomes faster. They must be made more substantial and be more firmly fastened in place. Because of their greater weight they must also be more pliable and more easily handled than in the past. Probably an ideal turnout would be a regular curve throughout the entire turnout with easement curves to reach the tangents at each end. This refinement has not even been attempted at the present time, but it would be unwise to say that it may not be attempted in the future, as will also other improvements and betterments of our switches, which are likely to develop through improvement in the quality of steel and the necessity occasioned by the operation of high speed trains.

With the present status of manufacture of frogs and switches Mr. Stevens' statement that a No. 15 frog can be operated with less discomfort than is caused by the change of direction at the point of switch is probably true. It does not necessarily follow, however, that the No. 15 frog is the sharpest frog which should be used. While the passing through a switch point may occasion a sudden jar, it would be logical to conclude that the quicker the train gets back to its normal condition, the better. It is not uncommon to see trains taking a switch at 35 to 40 miles an hour, and if they are to ride easy on the 3 deg. curve of a No. 15 frog, the lead rails must be elevated. Little elevation, however, would be necessary on the 1 deg. 49 min. curve of the No. 20 frog, as per Mr. Stevens' table, and it would certainly ride easier without elevation than the 3 deg. 12 min. curve of the No. 15 frog. As long as we cannot elevate the outer rail, the flatter the curve, and the shorter the sharp curve at the switch point, the easier will be the movement of trains at high speed through the turnout.

With this in mind, it would not appear to be the best policy to stop our improvement of frogs with a No. 15, but we should try to improve conditions still further and get a lighter curve, so that trains can go at higher speed. There is no reason why a sharp frog like the No. 20, or even sharper, should not be made perfectly safe as far as the frog and turnout leads are concerned, for they can be fastened as securely as any curve of the same radius. Necessarily they are more expensive, and for that reason are not acceptable for all places, but where it is not a matter of expense, but a matter of improved operation, it is fair to conclude that a No. 20 frog is better than a No. 15, even with the present switch points.

Concerning the switch point, there are many chances for improvement over its present usual construction. If found desirable, we can use longer rails, for the rails can readily be rolled double the present standard length if there is any advantage in it. It may also be desirable that special steel shall be made for switch points and frogs. With these two improvements, which are in use on a number of roads, it is not a very long step to make the switch points curved and of sufficient length to become equivalent to the 1 deg. 49 min. curve of the No. 20 frog lead, or even less if necessary.

There has been such marked improvement in the turnout in the past few years, so many frogs of higher number are being

used than formerly, and switch points are so much longer than they formerly were, that development is sure to continue and further improvements made over those of the past. I do not mean that Mr. Stevens indicated there would be no improvements in frogs and switches, but the conclusion which he reached in regard to frogs and the length of the switches might give that impression.

Mr. Stevens' interesting article and valuable table are a very complete and up-to-date outline of present conditions and methods of construction.

GEO. H. BREMNER,
Engineer, Illinois District, C. B. & Q.

PRELIMINARY STEAMING OF TIES.

CLEVELAND, Ohio, January 26, 1912.

TO THE EDITOR OF THE RAILWAY AGE GAZETTE:

Among the papers presented at the convention of the Wood Preservers' Association and printed in the *Railway Age Gazette* of January 19, is one by F. J. Angier, superintendent of timber preservation of the Baltimore & Ohio. Its title is "Treating Seasoned vs. Unseasoned Ties." While not specifically so stated, the impression left on my mind after reading this paper, and I think on that of most readers, is that no economy is effected or advantage derived by steaming timber prior to impregnation. Upon careful examination of the paper, and through correspondence with Mr. Angier, I learn that it was not his intention to convey that impression. He writes: "I am simply comparing air seasoned ties with absolutely green ties or fresh cut ties, that come to the plant, and which would have to be steamed in the same cylinder in which they were treated." Mr. Angier was discussing the question of steaming and treating ties in the same cylinder, and his conclusions, as I understand them, are not against the principle of steaming ties and timbers, but against the method of steaming and impregnating ties and timbers in the same cylinder. When the steaming and impregnating is done in separate cylinders it tells a very different story.

There is another clause in Mr. Angier's paper which might perhaps be misunderstood. He says, in discussing seasoned ties: "In addition there would be a better penetration of the preservative; therefore, a longer life obtained for the ties." By this I understand that he means that unless the ties are air dried after the steaming, so as to remove the condensed vapor and water in the pores and cells, the entrance of the chemical into the wood will be obstructed. That is quite correct. Experience has demonstrated that it is not feasible to impregnate timber with antiseptics immediately following the steaming, because the cells and pores are usually filled with water or condensed steam, which resists the entrance of the chemical. A fair penetration can be obtained with zinc chloride, because it is a water solution, but scarcely any can be obtained with creosote oil.

I grant that it is not economical or feasible to steam and impregnate ties and timbers in the same cylinder; but when this is done in separate cylinders the result is quite different. To illustrate, let us assume that the cost of treating ties by the Card process (zinc chloride combined with creosote oil) without preliminary steaming, is 20 cents, and the average life 12 years. Also, let us assume that the cost for steaming and treating ties by the Goltra and Card processes, is likewise 20 cents per tie, and that the life is thereby increased one year on account of the steam and subsequent air drying. The comparison would be as follows:

FIRST METHOD.

Cost of ties	50 cents
Cost of treatment	20 "
Laying in track	15 "
Total	85 cents

Life 12 years. Annual charge (from published tables) .0901.

SECOND METHOD.

Cost of ties	50 cents
Cost of treatment	20 "
Laying in track	15 "
Total	85 cents

Life 13 years. Annual charge (from published tables) .0850.

The difference in the annual charge is .0051 cents per tie per year. Multiplying this by the average number of years, which in this case is 12½, gives .0637, or 6⅜ cents per tie, which represents the relative economy of the two methods. Should 1,800,000 ties be treated annually, this saving or gain by steaming ties and subsequent air drying, would amount to $115,000. To this should be added the interest on the net reduction of stock made possible by artificial seasoning, insurance, taxes, etc., which, I estimate amounts to no less than $35,000 in the case under consideration, making a total of $150,000 gained or saved by steaming of the ties, which is enough to build and equip a plant every year.

This is almost incredible, but becomes clear when figures and estimates are brought down to a measurable basis. If it be granted that steaming and subsequent air drying of ties will put them in better condition to absorb the antiseptic, and thereby cause a better penetration and dissemination of the chemical, and a consequent increase in the average life of the ties of one year only, the statements I have made above are correct. The definite amount gained or saved by steaming of ties is a simple arithmetical problem, after the premises have been agreed on. The cost of steaming and treating ties in the same cylinder is just about the same as that of doing the work in separate cylinders; in fact, by means of labor and time saving appliances, suitable yard arrangement, etc., the cost of handling the ties, which constitutes the bulk of the expense, can be actually lessened.

We should not lose sight of the fact that Mr. Angier is simply comparing ties steamed and treated in the same retort, which would, of course, reduce the output of a plant that treated ties in this manner. If the plant is suitably constructed and provided with separate steaming cylinders, ties can be steamed simultaneously with those that are undergoing treatment and the output of the plant, therefore, would not be curtailed.

I think it is generally conceded that the steaming of ties or timbers prior to impregnation is essential to secure good treatment. For 20 years after tie treating began to be practiced extensively by several railways in this country steaming was used invariably, and also very extensively, if not invariably, in foreign countries. Six or eight years ago the practice was discontinued in this country in some places, particularly where creosote treatment was employed, not because steaming was considered useless or ineffective, but mainly for other reasons, such as expense, probable injury to the timber, and difficulty of impregnating timber with creosote oil. All of these objections can be readily overcome by the application of proper methods of treating and with suitable facilities.

Finally, Mr. Angier says that the disposition of sewage is a difficult problem. This is perhaps true when the steaming and treating is done in the same cylinder, but it is not the case when the work is done in separate cylinders. By the former method the extracts from the woods are mixed with poisonous chemicals, and would pollute the streams if they were turned into them. On the other hand, saps and juices extracted by steaming of wood in separate cylinders would be free from poisonous substances, and therefore not objectionable, and could be turned into the streams like other sewage, provided no use could be made of the extracts. Perhaps it may be found that the extracts have some value as a by-product.

W. F. GOLTRA.

The Italian army in Tripoli laid a portable railway from that port to Ain Zara, and has already begun to build a permanent railway in its place. For this purpose it has adopted the narrow-gage system which is used in Sicily for local lines. The gage is 37½ in. The material and rolling stock originally destined for these Sicilian lines is thus immediately suitable in Tripoli. Sundry Italian corporations are already proposing to build railway lines on their own account in the newly conquered territory.

TRACK KINK CONTEST

FIRST PRIZE—HANDLING SNOW AND ICE WITH A SPREADER.

BY A. M. CLOUGH,
Supervisor, New York Central, Batavia, N. Y.

The weather conditions of the past month have taxed all the resources on our road to keep the ice down, especially at our track water pans. We have 54 regular trains on tracks Nos. 1 and 2 every 24 hours, scooping water, exclusive of second sections and extra trains also using those tracks. The accompanying photographs show the conditions at these points and the

Fig. 1—Ice Pushed over Shoulder of Embankment by the Spreader.

means used to handle the ice and to keep the pans, or troughs, in working condition.

Fig. 1 shows where the ice which has been loosened by pick and shovel has been pushed on to the shoulder with a roadbed spreader equipped with a special wing for the purpose and at a large saving of laborers and hand work.

Fig. 2 shows the spreader working on track No. 3, and putting the ice over track No. 4 out of the way over the shoulder,

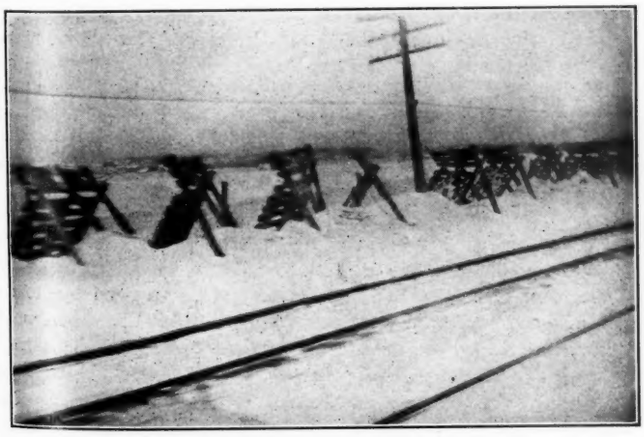


Fig. 3—Showing Arrangement of Snow Fence on Narrow Right of Way.

a flanger being used to flange from between the rails. Snow can be handled in the same way, the flanger being run just ahead of the spreader. Each one of the operations handled in this way saves much labor and is well worth trying by any road having machines that can be equipped and used for the purpose.

Fig. 3 shows a way to place snow fences where the right of way is narrow and where if portable snow fences were placed parallel with the track the snow would settle directly on the nearest track. By placing them at an angle with half of each

Fig. 2—Spreader Pushing Ice over Adjacent Track onto Shoulder.

section overlapping the other a double baffle for the snow is found and a drift or suction is created which keeps the snow entirely off the track.

SECOND PRIZE—SQUARING UP THE HEAD OF A SPIKE MAUL.

BY P. H. HAMILTON,
St. Louis & San Francisco, Pittsburg, Kan.

When returned from the shops after having been repaired, spike mauls generally appear to be in first class shape. But in a short time many of them chip off and become battered so that they are in poorer shape than when they were sent in for repairs. I find that in squaring up the head a blacksmith will frequently draw it out a little, making a cup in the striking face; then he will square up the corners with his hammer, and will smooth it up with a rasp or file while the metal is hot. In drawing out the battered end of the spike maul he will introduce flaws in the metal, and when it is used it will chip off again where these flaws were found. After drawing out the head the frog repairer on this division always cuts off about 3/16 in., with a hot cutting chisel. This removes most of the flaws and insures a good striking face. I have noticed that the tools repaired by the frog repairer are generally in service much longer than those repaired in the shops, simply because he is working for the interest of the trackmen. A few extra minutes that a blacksmith will use in shaping up a spike maul properly will probably lengthen its period of usefulness in the hands of the trackman several weeks.

SOCKET ON HAND CAR FOR FLAGS.

BY J. L. TAYLOR,
Assistant Engineer, Grand Rapids & Indiana, Fort Wayne, Ind.

A section foreman frequently needs his red or green flag on a moment's notice. Even if they are kept in the box formed by the uprights of the handle-frame, there is always a chance that tools, dinner buckets or coats are on top of them, causing confusion and delay. A piece of old air-hose nailed to one of the uprights of the handle frame makes an excellent socket to hold the flags, making them ready for use in case of necessity.

SOME MOTOR CAR KINKS.

BY P. H. HAMILTON,

St. Louis & San Francisco, Pittsburg, Kan.

The following suggestions regarding the operation of motor cars are not given in instruction pamphlets, and may be of value to those who have to handle such cars.

LUBRICATION.

One foreman on this road had a car on which each cylinder was lubricated from an oil cup on top of the cylinder. In the summer time he had trouble keeping the cylinders properly adjusted, for the heat from the cylinders would warm the oil and make it thin, and would allow too much oil to get into the cylinders. He overcame this by lengthening out the stems of the lubricators with a piece of copper tubing and raising them away from the heat from the cylinders. In the winter he removed the tubing and set the lubricators back on the cylinders.

A car on which the lubricating oil is taken into the cylinders through the carbureter with the gasolene should have the gasolene tank and feed pipe leading to the carbureter cleaned at least once a month. The gasolene is always evaporating while the lubricating oil is not, and as a foreman hardly ever uses his full tank of gasolene each day, the proportion of lubricating oil to the gasolene in the tank is ever increasing. If the tank is not occasionally drained and cleaned out the lubricating oil in the mixture will become too strong. The carbureter should be cleaned occasionally, but the inexperienced foreman had best not attempt this, for he may get it out of adjustment. The gasolene should always be run into the tank through a strainer, preferably a chamois skin, or some tightly woven cloth, to keep dirt out of the tank.

COOLING AND WARMING THE CYLINDERS.

The cylinders of cars which are air cooled are not supposed to get very hot, but in the summer time they sometimes do, and it is hard for a foreman to overcome this. One way of cooling the cylinders, when the foreman has not time to stop, is to shut off the gasolene, cut out the spark, then open up the priming and relief valves on top of the cylinders and let the car coast as far as possible. This draws cool air into the cylinders and aids in cooling them.

If the foreman is having trouble keeping the cylinders warm enough to "shoot" in the winter time, he should carry a blanket or several burlap sacks with him and wrap these around the cylinders when he stops. This will assist in keeping the cylinders warm. He should also have a tarpaulin to put over the car when it is out and exposed to the weather, as it is impossible to start a motor car if sleet and ice have been allowed to get on the cylinders. The car should be kept dry at all times if possible, as short circuits are apt to be formed if the woodwork is allowed to get water-soaked.

PRIMING.

Sometimes it is necessary to prime the cylinders before starting. A piece of small rubber tubing, attached to the gasolene feed pipe drain cock and long enough to reach the priming cups will come handy at such times. By opening the tank drain cock and then closing it quickly the tube will contain enough gasolene to prime both cylinders, as it takes but a few drops.

RELIEF WHEN CAR PLAYS OUT.

Whenever the car plays out and it is necessary to push it into headquarters, the foreman can take out the spark plugs in addition to opening the priming and relief valves, if there is no danger of anything getting into the cylinders. By taking out the spark plugs the greater part of the compression is eliminated and the car can be pushed as easily as a push car.

RUNNING BACKWARDS IN WINTER.

The end with the loose wheels is generally considered the front end of the car, and the car is generally run this way. This is all right in the summer time, and it is necessary that the cars be run this way as much as possible to get a strong breeze of cool air on the cylinder heads. But in the winter the car should be operated with the loose wheels to the rear so that the cold air will be kept from the cylinder heads. The cylinders will generally keep cool enough in winter without the current of air striking the cylinder heads.

TESTING BATTERIES.

Much trouble is experienced with section motor cars from weak or dead batteries. Sometimes new batteries are dead when received. Each foreman in charge of a motor car should be furnished with an ammeter, the cheapest of which cost about $1.50, with which to test batteries. If no ammeter is handy he can tell whether a battery is strong, weak or dead by placing the blade of a common pocket knife on the connection nut on the outer edge of the battery, and moving it slowly forward until the point barely touches the carbon post (not the nut on the carbon post) which extends from the center of the cell. If the carbon post gives off a small curl of smoke where the point of the knife blade comes into contact with it the battery is all right, but if it does not the battery is very weak, and probably no good at all. While this does not measure the strength of the battery it will give some idea as to its strength.

ABSTRACT OF ENGINEERING ARTICLES SINCE JANUARY 19.

The following articles of special interest to engineers and maintenance of way men to which readers of this section may wish to refer have appeared in the issues of the *Railway Age Gazette* since January 19:

Great Northern Ore Loading Dock at Allouez, Wis.—The details of construction of a new steel and reinforced concrete ore-loading dock which the Great Northern has recently built for handling its ore traffic were described in an illustrated article in the issue of January 26, page 145.

Ore-Loading Docks.—An editorial commenting on the three distinct types of ore-loading docks which have recently been built at the upper lake ports was published in the issue of January 26, page 136.

Reconstruction of Canadian Pacific Yard at Ft. William, Ont.—The replacing of the old Canadian Pacific poling yard at Ft. William, Ont., by a gravity yard was described and illustrated in the issue of January 26, page 153.

The closing sessions of the Wood Preservers' Convention were reported in the issue of January 26, page 165.

Construction of the Copper River & Northwestern.—The peculiar and interesting features of the construction work on the Copper River & Northwestern, one of the most important railway lines in Alaska, were described in an illustrated article in the issue of February 2, page 191.

Hard and Soft Rails.—The testimony of President Farrell of the Steel Corporation, before the congressional committee, was published in the issue of February 2, page 209.

The Rail Situation.—An editorial continuing the discussion on rails and commenting particularly on the testimony of President Farrell, of the Steel Corporation, appeared on page 226 of the issue of February 9. This is the third of a series of editorials on this subject, the others appearing in the issues of December 15 and January 12.

Suspension Bridges and Cantilevers.—The review of a book on this subject by D. B. Steinman was published on page 228 of the issue of February 9.

The Railways' Interest in Forest Fire Prevention.—The necessity for forest fire prevention, and methods which railways are adopting to aid in this work, were discussed in an illustrated article by E. A. Sterling, forester of the Pennsylvania Railroad, which was published in the issue of February 9, page 231.

New Radcliffe Viaduct on Great Northern of England.—The

old Radcliffe viaduct of the Great Northern of England, originally built of timber, has been entirely rebuilt of brick. It consists of 56 spans, and has a total length of 1,254 ft. The reconstruction of this viaduct was described in the issue of February 9, page 235.

GOLD HILL RELOCATION OF PANAMA RAILROAD.*

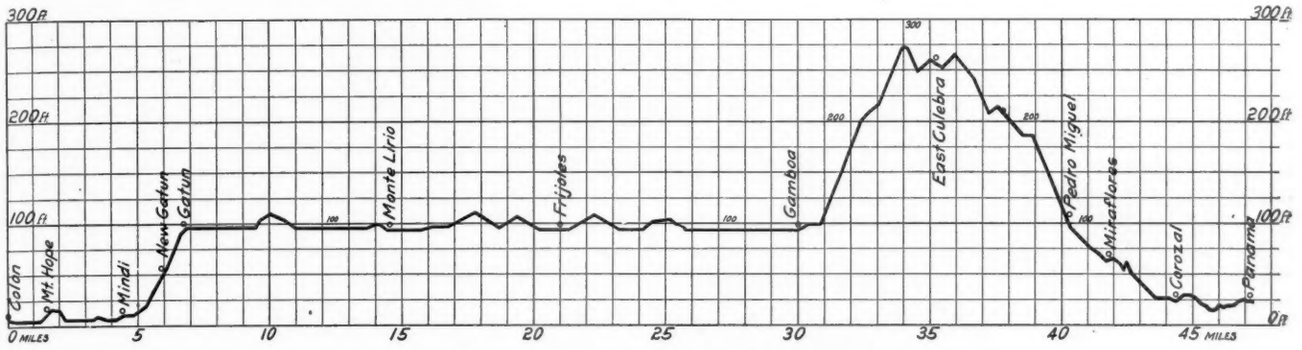
The relocation of the Panama Railroad was made necessary by the decision to adopt the 85-ft. level lock canal, which involved the building of a dam, converting the Chagres river valley into Lake Gatun and submerging the greater part of the present line. The general plan of the relocation and the work done in the early stages were described in the *Railway Age Gazette* of February 11, 1910. At that time the relocated line was projected through the Culebra cut on a 40-ft. berm at elevation 95. The numerous slides which developed along the east side of Culebra cut threatened this location, however, and upon the recommendation of a board, consisting of H. H. Rousseau, Major Chester Harding and Lieutenant Frederick Mears, this line was abandoned, and the so-called high line around Gold Hill was substituted. The reasons given by the committee for this recommendation are set forth in the report as follows:

"1. The disadvantages and inconveniences arising from the difficulty of access with such a 'berm-line' track so far below the level of the natural ground between Gamboa and Pero Miguel have become more pronounced and have assumed much larger relative weight.

"2. During the present rainy season, as the excavation in the cut has gone deeper, the difficulty of keeping the berm-line road-free from interruption before the banks have taken their final slope, which cannot be expected to occur until some time after the completion of the canal, has become more evident, and is now a potent factor in considering this question.

"3. With a high line for railway traffic and a berm line for construction and maintenance work only, the committee believes that the omission of the greater part, if not all, of the concrete retaining walls through the cut, the construction of which was originally contemplated, can be seriously considered. These retaining walls could only be built at a large expense, and there is some doubt as to their necessity and permanent value. The estimate of December, 1908, included an item of $4,000,000 for these retaining walls."

This report was approved July 26, 1910, and the necessary surveys were begun. The problem was to locate a line connecting the south end of Gamboa bridge over the Chagres river with the completed portion of the relocated line near Pedro Miguel. It was necessary to keep this location well away from the edge of the Culebra cut to eleminate danger from slides. Preliminary surveys showed three critical points: First, the section immediately south of Gamboa bridge involving the getting out of the canal section at the north end of the Culebra cut and reaching the high level of the natural ground along the east bank; second, crossing the LaPita divide which lies perpendicular to the general axis of the canal; and third, crossing a high divide near the town of Paraiso. It was decided soon after the locating party entered the field to adopt a 1¼ per cent. grade in order to secure a roadbed benched in the solid ground beyond



Profile of Relocated Line; Panama Railroad.

*Abstracted from the annual report of the Isthmian Canal Commission for the fiscal year ending June 30, 1911.

The Quebrada Baja Bottom, Showing Settlement of Fill.

the influence of slides. The line runs up the valley of the Pedro Miguel river, which is quite narrow with steep, rugged sides. About 4 miles from the station of Pedro Miguel it turns up a small tributary nearly at right angles to the main stream, and approaches the continental divide. This divide is crossed in a low saddle, after which the line continues over the valleys of the Rio Gamboa, Rio Obispo and Rio Mesambi.

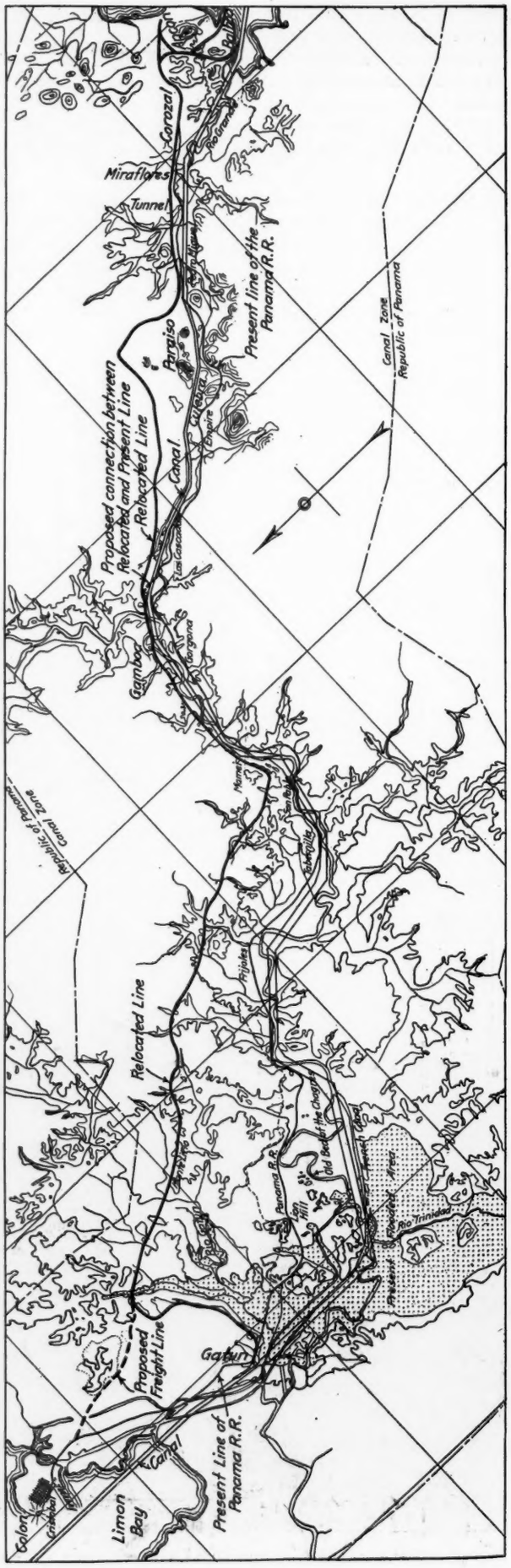
This section was fairly easy country for railway construction, the first real difficulty coming in the crossing of the La Pita range. Lines were located through several saddles, the one finally adopted being about one mile east of the canal axis. The crest of the grade is on this LaPita divide, being reached from Gamboa by a practically continuous 1¼ per cent. grade. After crossing this divide the line skirts the base of a high range of hills for about a mile.

The usual difficulties incident to railway location in a tropical

Trestle Across Deep Valley Back of Paraiso.

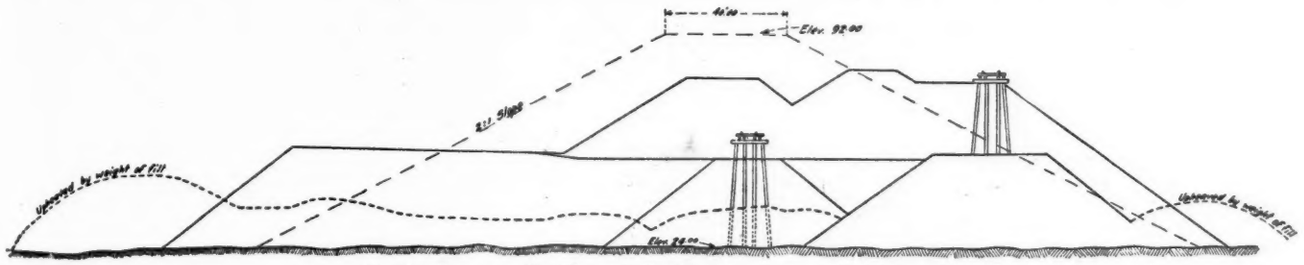
country were encountered in this work. The progress was limited by the amount of line the machete men could cut in one day, varying from 3,000 to 6,000 ft. All topography was taken by accurately locating contours on 10-ft. intervals. From the knowledge of the country gained during construction only minor changes in the alinement made on this location have been found necessary, and all of these were put in effect before construction work was started.

Construction work was begun January 1, 1911. The cut and fill on the whole line was about balanced, and totaled 1,125,000 yds. Concrete culverts required 9,000 yds. of concrete, and there was 2¼ miles of temporary trestle to be driven. About 275,000 yds. of the grade was hand work, the remainder steam shovel. On a short section, including about 75,000 yds. of hand work, a flat price of 47 cents per cu. yd. was paid, the railway furnishing tools and Decauville equipment. Trestles were driven across all deep valleys, untreated piles and second-hand decking being used. The work was so laid out that all available construction plants could be used continuously, and there were no delays on



Location of Relocated Line of the Panama Railroad.

account of grading or lack of material. Culverts were built where possible by hauling in gravel and cement over standard track. In a number of cases, however, grading would have been delayed by waiting for this method, and material was therefore hauled in by wagons and carts; and in some cases ruble masonry culverts were built of stone secured near the site. The culvert work was 85 per cent. complete and trestles were 95 per cent.



Typical Cross Section of Quebrada Baja Embankment.

complete at the end of the fiscal year. The following is a summary of work done on the Gold Hill line for the fiscal year:

Total excavation, cu. yds.	696,742
Concrete placed, cu. yds.	7,034.7
Trestle driven, linear ft.	11,446
Temporary track, linear ft.	53,639
Clearing done, acres	256.93
Total expenditures to July 1, 1911	$498,610.41

The work on the remainder of the line is rapidly nearing completion. On June 30, 1910, the line between Gatum and Gamboa was practically completed, excepting that portion across the main valley of the Gatun river and its tributaries. These valleys contain in the aggregate 4,000,000 cu. yds. of fill. This work was pushed during the past fiscal year, and there remained on June 30, 1911, only 850,000 cu. yds. to place. The principal excavation on the new line was from borrow pits in which steam shovels made very favorable showings. The grand average output of steam shovels in borrow pits for the fiscal year was 1,592 cu. yds. per day; the material handled being 60 per cent. rock.

A number of slides and settlements have been encountered in the work across the valleys of the Gatun river and tributaries, the most serious of which has been in the Baja bottom. It is about 60 ft. from top of ground to solid rock in this valley, the material intervening being of the softest clay, decomposed wood and vegetation. The weight of the filled-in earth and rock has pushed away the softer material and practically settled to bed rock. This embankment is now within 10 ft. of grade, with a heavy counterweight on either toe, and it is anticipated it can be completed within a short time. In the Quebrancha bottom rock is overlaid with a soft deposit of sandy clay and a harder stratum of clay and pure sand near the ground surface. The first deck of the embankment across this valley was put in to elevation 50 and filled well over the entire area out to the 2:1 slope stakes. A trestle was then driven to elevation 70, and filling through this level was started when a small settlement occurred on the line of the trestle with corresponding upheaval of the natural ground beyond the slope stakes. This ground was further counterweighted by filling in well beyond the slope on both sides and the work of raising the center line to permanent

Piers for Bascule Bridge Over Gatun River.

grade was continued. By keeping careful watch on settlement and upheaval the permanent embankment has been brought very close to proper grade. A small settlement occurred at the south end of Gatun river valley, where the embankment had been raised to elevation 97. The excessive weight of the fill caused a small slide to develop along the west toe, which pushed up the natural ground for a distance of 200 or 300 ft. This upheaval has now been filled over and counterweighted and no further trouble is anticipated.

The construction of a permanent telegraph and telephone line was undertaken during the last fiscal year. The line utilizes 56-lb. steel rails for poles, and is provided with four cross arms, 10 pins to the arm. No. 10 hard-drawn copper wire is used.

Heavy Pan Car Work on Gold Hill Line; Panama Railroad.

The line from Gatun to Gamboa was 50 per cent. complete on June 30. Ballasting operations were continued throughout the past year, Chagres river gravel from a pit at Gamboa being used for this purpose. About six miles of 90-lb. rails were laid on the completed section near Gatun, most of this length being laid on hard wood ties, with tieplates and screw spikes. The section of the relocated line from Paraiso Junction to Corozal Junction, 4.1 miles, was turned over for operation on September 4, 1910. Regular operation on the section of the line between Gatun and Gorgona was begun on February 15, and the tracks on that section of the old line will be removed in the near future in order that they may be entirely out of the way by April 1, when Gatun Lake will begin to rise to the 50-ft. level. Between Gorgona and Panama the present line will continue in service until the canal work is approximately completed. Trains cross from the present to the relocated line by tracks on top of the Gamboa dike, which separates the water of the Chagres river from the Gulebra cut. It is expected that the Gold Hill Line will be completed by April 1.

Lieutenant F. Mears is chief engineer in charge of this relocation, and is assisted by H. P. Warren, engineer of construction, and M. B. Connolly, superintendent of construction.

The earnings of all those railways in Germany whose fiscal year begins with April, about five-sixths of the total number, during the nine months ending with December last increased 7½ per cent. over the previous year—8.3 per cent. in freight tonnage and 5.2 per cent. in freight earnings. The increase in gross earnings was more than $25,000,000.

CREOSOTE SPECIFICATIONS AND ANALYSIS.*

BY S. R. CHURCH.

Creosote oil is a by-product of a by-product. On this account the tar distiller faces a somewhat difficult situation, for on the one hand, no one has ever succeeded in buying coal tar on specifications, except that excess of water can be deducted from the bill, and on the other hand, the pitch made from this coal tar must be of various grades to meet the requirements of the roofing trade, paving trade, briquetting industry, and all the other purposes for which pitch is used. In distilling these tars to pitch, creosote oil is obtained, and to market the oil, it must comply with certain specifications. The character of the oil—that is, its specific gravity and boiling point—depends more than anything else upon the grade of pitch that is being made; for instance, if you should make very hard pitch, and take off more oil to do so, then the oil as a whole will have higher boiling points.

Since the beginning of the tar industry in the United States, the largest single department has been the production of roofing materials. In the manufacture of tar roofing materials we are as far ahead of Germany today as Germany is ahead of us in the manufacture of coal tar colors. Therefore the American tar distillers try to produce the best possible grade of pitch for the roofers.

Meantime, on the Continent, and also to some extent in England, the tar distillers have comparatively little roofing business, and for many years their biggest demand for pitch has been for briquetting purposes, which requires a hard pitch. The development of the color industry brought European tar distillers their most profitable outlet for by-products and naturally the creosote oil was robbed of whatever constituents would be of value in the color industry. With characteristic far-sightedness, the German tar distillers, seeing what sort of oil they had after they had extracted everything they wanted, extolled the merits of this oil, and created a demand for it for creosoting purposes. This German oil is probably a highly desirable grade of cresote oil. It is a fact, however, that the longest records of service of creosoted timbers, both in England and America, are of timbers treated with oils very different in character, and containing much higher percentage of the napthalene and so-called low-boiling fractions than the German oils.

For some years the tar distillers in the United States have realized that conditions are changing. The roofing business, though still of tremendous proportions, no longer represents the only large outlets for pitch. Coal briquetting with pitch binder is already an industry of no mean proportions. In an endeavor to obtain as much creosote oil and as high boiling oils as possible, the use of hard pitch for various purposes is being actively promoted, and chemists are continually carrying on investigations looking toward new uses for coal tar pitch.

It is my purpose, without going very far into the merits of different grades of oil from a scientific standpoint, to briefly state and answer a few questions.

1. What are the principal specifications in use in the United States today?
2. How did these specifications come about?
3. Would any modification of them be desirable?

1. Without question, the creosote oil specification of the American Railway Engineering Association (as published in Bulletin 107, January, 1909, in the report of the Committee on Wood Preservation), is the most widely known and probably the most widely used of any. The railways consider this a standard for oil for tie treatment, to which they would like to adhere as closely as possible.

As ties constitute about two-thirds of the total timber treated in the United States, the importance and far-reaching effect of this specification, provided it were in actual use by all railways

*Abstract of an address before the eighth annual convention of the Wood Preservers' Association.

and companies treating for railways, can be readily seen. The specification is as follows:

The oil used shall be the best obtainable grade of coal tar creosote—that is, it must be a pure product of coal tar distillation and must be free from admixture of oils, other tars or substances foreign to pure coal tar; it must be completely liquid at 38 deg. C., and must be free from suspended matter; the specific gravity of the oil at 38 deg. C. must be at least 1.03. When distilled according to the common method—that is, using an eight-ounce retort, asbestos covered, with standard thermometers, bulb one-half inch above the surface of the oil—the creosote, calculated on the basis of the dry oil, shall give no distillate below 200 deg. C., not more than 5 per cent. below 210 deg. C., not more than 25 per cent. below 235 deg. C., and the residue above 355 deg. C., if it exceeds 5 per cent. in quantity, must be soft. The oil shall not contain more than 3 per cent. water.

Next to crossties, the most important class of timbers is piling, including dock timbers. Undoubtedly the service requirements for this class are more severe than for any other. The mechanical life is unlimited, and the desired end of treatment is to add as many years as possible to the life of the wood. Yet, for this work there is today no oil specification recognized as "standard" to any such extent as the Maintenance of Way specification is for tie treatment. A typical specification for oil for piling is as follows:

Specific gravity, not less than 1.02.

The oil shall contain not less than 30 per cent. naphthalene (210-235 deg. fraction) and not over 10 per cent. of tar acids.

Poles and crossarms do not, as yet, constitute a very large class of treated timbers, one, however, that will no doubt become of much greater proportionate size. The National Electric Light Association, representing 90 per cent. of the light and power companies of the United States, has adopted the following specification for oil:

1. It shall have a specific gravity of at least 1.03 and not more than 1.08 at 38 deg. C. If the gravity is taken at a higher temperature, a correction of .0008 for each degree C. above 39 shall be made.
2. There shall not be over 1 per cent. of residue insoluble in hot benzol.
3. The original oil shall contain not over 2 per cent. water.
4. The oil shall be miscible in absolute alcohol, volume for volume.
5. The residue remaining upon sulphonating a portion of the total distillate shall not exceed 1 per cent.
6. The oil shall contain not more than 8 per cent. of tar acids.
7. When 200 grams of the oil are distilled in accordance with the requirements of the specifications for the analysis of coal tar dead oil or coal tar creosote, hereinafter referred to, and results calculated to water free oil: Not more than 5 per cent. of oil shall distil off up to 205 deg. C. Not more than 35 per cent. of oil shall distil off up to 235 deg. C. The percentage distilling to 245 and 270 deg. C. shall be noted. Not more than 80 per cent. shall distil off up to 315 deg. C. The coke residue shall not exceed 2 per cent. The distillate between 205 deg. C. and 235 deg. C. shall deposit naphthalene on cooling to 215 deg. C.

The Forest Service has recently put forward a tentative specification for creosote oil, which no doubt represents the best judgment of a very able group of investigators.

The creosote should be derived from the distillation of pure coal tar, free from any adulteration whatever or any mixture of undistilled tar. If it contain more than 3 per cent. of water, a deduction in price corresponding to the per cent. of water in excess of that amount will be made. It shall have a specific gravity at 60 deg. C. of not less than 1.04. When analyzed by the standard Forest Service method of analysis for coal tar creosote, it shall have the following fractions, calculated on a moisture free basis (when less than 3 per cent. water is present in the creosote it shall be considered moisture free):

Up to 205 deg. C., not more than 5 per cent. Up to 235 deg. C., not more than 40 per cent. nor less than 5 per cent. Up to 250 deg. C., not more than 50 per cent. nor less than 15 per cent. Up to 295 deg. C., not more than 65 per cent. nor less than 30 per cent. At 355 deg. C., the residue must be soft and not sticky.

On applying the sulphonation test to the fraction between 305 deg. C. and 320 deg. C. there shall be no oily residue insoluble in caustic alkalies.

The indices of refraction at 60 deg. C. shall be as follows for the following fractions:

At 250 deg. C., not less than 1.593 nor more than 1.602. At 290 deg. C., not less than 1.615 nor more than 1.622. At 300 deg. C., not less than 1.625 nor more than 1.632.

These represent typical American oil specifications, and, although there are a score or more of specifications in use, most of them are modifications of one of the foregoing.

For the purpose of comparison, a few modern European specifications are presented. Dr. Herman Von Schrenk quotes from a report by Mr. Henley on the treatment of poles by the British Post Office Department, as follows:

"To insist, however, upon a definite proportion of any particular constituent, except within fairly wide limits, would probably have the effect of raising the price of the oil to a prohibitive extent, and therefore the practice followed by the British Administration is to test each contractor's creosote, and if it be found to be a genuine commercial article, having a reasonable proporion of the desirable constituents, to allow it to be used for creosoting poles."

The limits which the Post Office Department regard as satisfactory are briefly as follows: To leave not less than 25 per cent, or more than 35 per cent. residue when distilled up to a temperature of 316 deg. C. To contain not less than 15 or more than 25 per cent, of naphthalene. To contain not less than 5 per cent. of phenol and other phenoloids. To be completely liquid at 38 deg. C. Not to contain more than 2 per cent. of matter volatile at 100 deg. C. In this connection it should be noted that the method of analysis used by the Post Office Department is that described as the standard method of analysis of the American Railway Engineering Association, with the exception that the thermometer bulb is placed in the oil.

The Austrian government specification for poles, according to Dr. Von Schrenk, is as follows:

Must have at least 10 per cent. tar acids. At 15 deg. C. it must have a specific gravity of 1.04 to 1.10. At this temperature no naphthalene must deposit. It shall only contain constituents whose boiling points are between 200 and 350 deg. C. When distilled (thermometer in the vapors) not more than 2 per cent. shall come over up to 200 deg. C., not more than 35 per cent. up to 235 deg. C., and at 300 deg. C. at least 65 per cent. must have distilled over.

The Hungarian administration requires for pole treatment a creosote oil of a gravity of 1.04 to 1.10; 10 per cent. phenols and 12 per cent. naphthalene.

Through the kindness of E. A. Sterling, I have obtained the following specifications, representing modern European requirements for oil treatment of cross-ties:

Prussian State Railways:

The creosote must be compounded in such a manner that not over 3 per cent. shall distil over up to 150 deg. C., not over 10 per cent. up to 200 deg. C., and not over 25 per cent. up to 235 deg. C. (Bulb of the thermometer to be in the vapor.) Specific gravity at 15 deg. C. must be between 1.04 and 1.1, and the oil must be perfectly clear at 40 deg. C. It must, when mixed with equal parts of benzol (capable of crystallization), remain clear without showing more than traces of undissolved bodies.

Great Western Railway (England):

The creosote is to be a pure coal tar distillate of the very best quality, free from all impurities, and on analysis must give the following results: To be entirely liquid at a temperature of 85 deg. F., and to remain so on cooling to 75 deg. F. To contain not less than 25 per cent, of constituents that do not distil over at a temperature of 600 deg. F. If any water is present, the total quantity yielded by distillation shall not exceed 3 per cent. To yield to a solution of caustic soda not less than 8 per cent. (by volume) of tar acids. The specific gravity of 60 deg. F. to range between 1.040 and 1.080, water being 1.000.

London and Southwestern Railway:

The creosote shall be of the description known as "heavy oil of coal tar," of the very best quality. It shall be free from all admixture and impurities. It shall be perfectly fluid at 60 deg. F., and, while standing at that temperature, shall give no deposit. It shall contain at least 25 per cent. of constituents which do not distil over at a temperature of 600 deg. F., and shall also contain not less than 8 per cent. of tar acids.

London and Northwestern Railway:

The creosote is to be a pure distillate of coal tar, to be entirely liquid at 90 deg. F., and to contain not more than 20 per cent. by volume of deposit at 60 deg. F. It must contain not less than 8 per cent. by volume of tar acids, and not less than 25 per cent. by volume of constituents which do not distil over at 600 deg. F. The boiling point is to be not less than 400 deg. F., and the first 25 per cent. of the distillate shall have a specific gravity greater than that of water. During the process of distillation the thermometer is to be immersed so that at the end of the distillation the bulb is just out of the oil; the retort to be heated by a naked flame.

Great Northern Railway (England):

The oil must come from gas works making bituminous coal gas, not water gas; it shall contain neither blast furnace nor coke oven creosote, and the company reserve to themselves the right to inspect the tar from which the creosote is made at the works. It must be wholly liquid at 95 deg. F. The specific gravity shall not be less than 1.025 nor more than

1.045 at 95 deg. F. The oil shall yield not less than 5 per cent. of tar acids to a solution of caustic soda of specific gravity 1.120. The oil shall yield not less than 30 per cent. by weight of pressed naphthalene after standing 12 hours, at or below 60 deg. F. When submitted to fractional distillation, the portion (inclusive of water) distilling below 170 deg. C. shall not be more than 4 per cent. by volume. The portion distilling between 170 deg. C. and 210 deg. C. shall not exceed 12 per cent. by volume. The portion distilling between 210 deg. and 270 deg. C. shall not be less than 50 per cent. nor more than 60 per cent. by volume. The portion distilling above 270 deg. C. shall not be less than 25 per cent. nor more than 30 per cent. by volume.

2. How did these specifications come about? I think it can be safely said that the European specifications are largely the result of the following condition: One railway, or government office, after years of experience with oil from some particular tar refinery, believing the results good, would draw a specification to cover (not too closely) oil of that character. No such widely adopted standard as the American Railway Engineering Association specification exists today in any European country. So far as I have been able to learn, they are not very particular as to exact compliance with the requirements of the specification, as long as they are satisfied as to the origin of the oil.

Our standard specification represents a general tendency in favor of what are known as "high boiling" oils—that is, oils containing as little as possible distilling below 235 deg. C. I think I can say, without fear of contradiction, that the sentiment in favor of this high distilling oil is not due to failures of timber preserved with oils of lower range. The new specification is rather a result of certain tests that have tended to show the volatility of the low distilling portions of the oil. Some of these tests were evaporation tests, made by placing oil in shallow pans, exposing them to the atmosphere and weighing them from time to time to determine the evaporative loss. Other tests were made by cutting sections from treated poles at the top, center and below the ground line, and comparing the distilling points of the oil extracted therefrom with the distilling points of the oil originally put into the poles. Some similar tests were made with treated ties.

3. Would any modification of the specifications be desirable? This question must be answered from two standpoints: Are the consumers of oil justified from a theoretical standpoint in demanding as "high boiling" an oil as required by the Maintenance of Way specification? Would a modified specification be desirable from a commercial standpoint?

In the first place, the Maintenance of Way specification is more rigid than the specifications governing oil used by the European countries in general, and by the railways of Great Britain particularly. It demands oil of higher boiling character than is used by the oldest commercial creosoting concerns in the country for general timber treatment, and higher than the National Electric Light Association's recently drawn specification for oil for poles and crossarms.

It seems perfectly rational to believe that, other things being equal, a high distilling oil is desirable from the standpoint of permanency.

However, from the standpoint of antiseptic efficiency the highest boiling portions of the coal tar creosote are not as effective as the middle portions of the oil. In a paper by J. M. Weiss, read before the Society of Chemical Industry on October 20, 1911, it was shown that the highest antiseptic efficiency is possessed by the oils distilling between 235 deg. and 270 deg. C., and that the fraction above 270 deg. was far less strongly antiseptic than the middle fraction or the fraction below 235 deg. By limiting the percentage distilling below 235 deg. to 25 per cent., the oil is thereby robbed of some of its most valuable antiseptic properties. In considering the evaporative loss of oils, it should be remembered that light oils, in volatilizing, carry with them fractions of higher boiling point. This is particularly true of naphthalene in the presence of light oils, when it is quite volatile at temperatures far below those at which it would normally volatilize. Hence, it is unquestionably good practice to limit the percentage of oil distilling below 205 deg. or 210 deg. C. to a minimum, as the light oil, which distils below that temperature, has no place in creosote, and hastens the evaporation of higher fractions. In a bulletin recently published by the Forest Products Laboratory a moderately high boiling creosote was shown to be practically as stable as the highest fractions distilled from it.

From a commercial standpoint, it is easy to show that the Maintenance of Way standard is unreasonably high. The only commercial creosote oil produced in large quantities that will meet these requirements is the German oil. A series of tests on 26 different tars produced in the United States was made in our laboratories recently, the oils obtained averaging as follows: Below 210 deg C., 11 per cent.; below 235 deg. C., 43 per cent.

Of these 26 oils only three could meet the Maintenance of Way specification. In order to make them meet it would be necessary to reject, by fractionation, at least one-third of the oil. The limitation of the 235 deg. fraction to 25 per cent. would, if rigidly enforced, eliminate over one-third of English and American oils.

ARRANGEMENTS FOR PILING TIES.*

BY J. H. WATERMAN,
Superintendent Timber Preservation, C. B. & Q.

I wish to call attention to the plan showing a proposed layout for a wood preserving plant. This is not a plan of the present yard at the Chicago, Burlington & Quincy treating plant at Galesburg, Ill., but it is an evolution of that yard. It has been designed with the assistance of an engineer, and all the curves, crossings, etc., shown are practical. This is an ideal layout designed for the piling of material only, and not for the location and arrangement of the plant. It can be shortened or brought closer together if desired without materially disarranging the

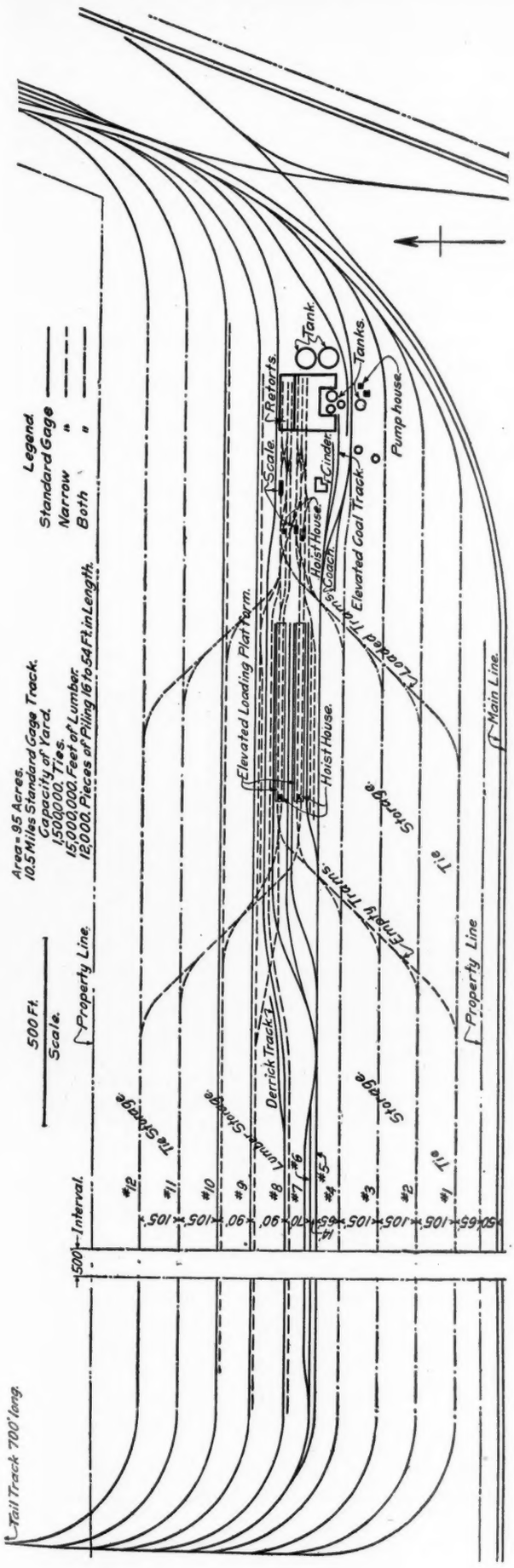
One to 8 Method of Piling Ties.

design. In other words, we have endeavored to make it so that it can be increased in either width or length, depending on the size one desires to make the yard.

This yard covers 95 acres, and has 10½ miles of standard gage track. Storage room is provided for 1,500,000 cross-ties, 15,000,000 board ft. of lumber and 12,000 pieces of piling, ranging from 16 to 54 ft. in length.

A switching lead independent of the adjacent yard is provided so that cars can be switched without interfering with the main yard. If this was not provided, when an engine came out on the main yard lead with a string of cars it would block all other movements on this lead. With this arrangement the tie yard is independent of every other yard. It will be noted that a lead is provided on the opposite end of the yard where from 25 to 30 cars can be switched. As an example of its use, consider 75 cars on No. 1 track, which is practically 4,500 ft. long. An en-

*Abstract of an address before the eighth annual convention of the Wood Preservers' Association.



Plan of Proposed Tie Yard.

gine might not be able to handle this number of cars at one pull, or it might be desired to cut the train in two and switch from either end. With this arrangement the engine could go down running track No. 5 and switch the cars on the west end from this ladder.

The sharpest curve is 16 deg. The frogs are all No. 7. The curves at the east end are lighter and are of course much easier to operate, but I do not think that a 16-deg. curve is a very difficult curve for a standard engine. From 20 to 25 cars can be switched on such a curve readily, and that is as many as one would care to switch in the average tie plant or material yard.

Special attention is called to the arrangement of platforms, to the standard gage tracks running on either side of them, and to the convenience in switching these tracks. No. 5 is the running track, and No. 6 and No. 7 are storage tracks for empty cars. Assume that the cars which have been set to the loading platforms are loaded and ready to be pulled out. The switch engine comes through track No. 5 and picks up the cars on the south side of the south platform. It then backs up, picks up the cars on the north side of the south platform, pulls down on No. 5 and cuts off. It then goes to the west end, and comes back through track No. 6, pushing the empty cars on this track ahead of it and setting them on the south and north sides of this south

Stacking of Piling.

platform. The engine then pulls the cars from the tracks on both sides of the north platform on to track No. 6, goes out through the west end of this track and shoves the cars which are on track No. 7 to the north platform. After this the engine takes the loads on tracks 6 and 5 out to the main yard.

The three-rail cross-over tracks in the yard should be noted. These tracks are designed so that a standard gage engine can push the loaded trams from either side of the yard to any one of the six retorts. It should also be noted that the platforms are intended to be elevated, hoisting engines being provided for filling the retorts and also for drawing the trams from the retorts on to the platforms for loading out. The design of the narrow gage tracks on the west end of each platform is worth special attention. An empty tram car can be dropped from either platform in either direction. I am not going into the question of the advantage of a standard or narrow gage engine for pushing the loaded trams, except to say that with a narrow gage engine the platforms would be built on the level and the other tracks would be depressed. With a standard gage engine the raised platform is preferred. However, this does not affect the general arrangement of the yard. I would call attention to three narrow gage tracks which I term hold-over tracks, two of which are south of the south platform and one north of the north platform. This will be discussed later.

In designing this yard it was desired to have a place for every-

thing. Any man connected with the handling of material yards knows that the expense of switching depends very largely on the number of times one has to move a car before releasing it. In this arrangement separate tracks are provided for creosote and zinc chloride, coal, cinders, derricks and coaches for the transportation of laborers.

For piling ties a three-rail track is provided which I think more practical than a narrow gage track on one side. In the first place, such an arrangement saves space. One does not have to carry the ties as far from the standard gage cars when unloading or to the tram cars when loading. With such a design a standard gage engine will push the trams to the retorts, where they can be reached with the cable of the hoisting engine.

In piling the ties in a new yard, I would first put them on track No. 1. When this was filled I would then go to track No. 2, then to No. 3, and so on, to No. 11 and No. 12. When I started to treat I would remove the ties from track No. 1 entirely before I went to track No. 2. While the ties on track No. 2 are being loaded I would begin to unload on track No. 1, and so on.

One will note that from 50 to 75 cars can be unloaded at one time on any of the tracks mentioned. The ideal way to unload is to begin, say, at the east end and unload to the center, then go to the west end and unload towards the center. While unloading on the west end, the empty cars on the east can be pulled out and other loads set in.

We pile the ties by what is known as the 1 to 8 method, shown in the accompanying illustration. They are piled four tiers back from the standard gage track. You will note that some of them are piled 20 high, and the question is raised whether they can be piled to this height all the time. In our practice, when we have a large number of ties and few men we let the men pile them low, but when we have few ties and plenty of men we let them pile them high.

In stacking lumber and piling a narrow gage track is provided to one side of the standard gage track for the use of a crane in loading trams. When using a crane the track needs to be clear. For this reason it is not practical to load piling and lumber on tram cars with a crane on a three-rail track. With a narrow gage track to one side the crane can move from one tram to another until they are all loaded.

The lumber is piled in the center of the yard instead of to one side. It often comes in long lengths, the piling ranging from 15 to 60 ft. long. By storing it here one avoids sharp curves in getting to and from the retorts. All piling, switch ties, and heavy lumber are handled with cranes.

The hold-over tracks for tram cars adjacent to the platforms were referred to. The question may be raised "what do we want with hold-over tracks?" One person may say that we cannot afford to have ties standing around on trams and not use the trams every day. We figured overhead charges on the plant at Galesburg for one year; that is, we took the total possible retort hours and divided it by the total overhead charges. We did not add anything for depreciation or interest on the plant, and we found that these overhead charges would average $1.50 per retort hour. On the Pennsylvania these overhead charges are figured at $3 an hour, or five cents per minute. From this it can be seen that one can afford to put a lot of money into trams to save delay at the retort. A few years ago in freight houses 10 freight handlers were provided with 10 freight trucks. Now in large freight houses they have 10 or 15 trucks for each man, and what is called the "drop truck" system is used. If one considers a plant with five retorts, the possible delays are 5 x 24, or 120 hours, for each 24 hours. If the retorts are idle one-fifth of the time, this amounts to $36 per day on the basis of $1.50 per retort hour, or $72 on the basis of the Pennsylvania figure. This will pay interest on a considerable number of tracks and trams. It means money every minute the retort is open. When studying the efficiency of a plant, I would first look to see if the retorts were working. When the retorts stop the plant is dead, while the overhead charges go on.

To further illustrate, let us consider one retort. The possible number of retort hours in a year on a 300-day basis is 7,200 hours, or 7,000 in round numbers. If the plant is delayed 10 per cent. of the time this would be a loss of 700 hours or $2,100.

One man will say that the yard arrangements appear to be ideal, but they require 10½ miles of track. This is a bugbear. I have estimated that this track, including laying and ballasting, but without grading, can be built for $100,000. The yard has a capacity of 1½ million ties, but we can treat from 2½ to 3 million annually. On the basis of 2½ million ties, the interest on this track cost is but two mills per tie. This is but a drop in the bucket. One can waste two mills per tie very easily. In the yard which is cramped a man can waste a cent a tie before he realizes it. We had such figures in view when I made this design. Some will say the company will not spend the money. They will spend the money if you can show them that it is practical.

My idea is to ask for what you want, and then stay with it until you get it. Never lay down. Never quit talking. Talk to everybody you meet about what you need. Talk to them until they are tired of you. You can get what you want if you stay with it.

It is not thought that this design cannot be improved. It is development of previous plans, and it is expected that these plans will be continually improved until we secure the ideal. The question of whether one would provide a raised platform or one on the level is optional. The use of a hoisting engine, a gasolene engine, an electric engine or a small locomotive, is also optional. This plan is simply submitted as a basis on which one can begin to work when designing a plant.

WINTER MAINTENANCE DIFFICULTIES ON NORTHERN RAILWAYS.

BY E. R. LEWIS,
Division Engineer, Michigan Central, Bay City, Mich.

The difficulties and the discomforts which beset the railway officers and employees of the northern railways in winter in the discharge of their duties can only be fully realized by those brought by chance or design into actual personal contact with the problem in all its phases. Long before the coming of winter, the snow equipment is examined to make sure that all is in good working order. Permanent snow sleds and tight board snow fences are repaired, altered or extended. Portable snow fence is shipped and placed where needed as indicated by past experience. Brush is cut and made to serve as a first line of defense against drifts. The rotary plow and its auxiliary, the snow crab, come out from the division shops in new coats of paint; and, let us hope, with every part in first class working order. They must be examined, tried out and supplied with the usual tools. The large push plows, equipped with air and with elevator wings, the hand worked winged plows, the smaller wingless flangers, the locomotive pilot plows and the truck flangers have all to be put in readiness for instant use, and tried out. Canvass tarpaulins for the locomotives and tanks, and rubber suits for the engine crews are overhauled and made ready at division points. Copies of the snow plow whistle signal code are distributed. Trainmen and operators report the weather from each station, and a record is kept on the train sheets by the despatcher. Reports on the weather and the condition of tracks are required each morning from roadmasters and certain of the section foremen. Government weather forecasts are also utilized at division points, and telegraphic warnings sent when and where it is deemed necessary. Rattan brooms, snow shovels, salt for switches, handcar brooms and broom holders, track shims, braces and second-hand spikes are stocked and distributed as necessities for winter use of the maintenance forces. All these preparations must antedate the coming of winter to combat successfully the obstacles to be surmounted.

The snow shed is, as the name indicates, a shed built over a track for protection against snow and snow slides, in a locality

where other methods of snow handling are more expensive.

The permanent snow fence may be tight or an open board fence. A tight board fence 8 ft. high forms a good protection against snow. The advantage of a portable snow fence, which is economical in panels 16 ft. long, is, of course, its portability. Snow does not always come with a wind from the same direction year after year. It is frequently necessary to alter the position of fences protecting a certain piece of track, until the best possible results are obtained. Portable fences may be set in fields parallel to the tracks, but off the company's land, and removed in summer. They may also be moved back away from the track in late winter to provide more room for late snows, or they may be set on top of earlier formed snow banks for additional protection.

A brush fence is made of large fagots laid on the ground or snow parallel with the track. Across these fagots and at right angles to the track, are placed other bundles of brush, 16 ft. long, with butts resting on the ground toward the track, and with tops in the air pointing away from the track. This brush fence is a splendid snow catcher, economical and effective for its purpose, but likely to catch and spread fire in summer.

The rotary snow plow and its uses are too familiar to every railway man to necessitate explanation here, but the less spectacular snow crab, a most useful piece of equipment for fighting hard snow in narrow cuts, is very little known. Those who have had experience in the handling of snow plows during the six or seven months of severe storms, which largely make up the far northern winter, are aware that the snow becomes packed so hard in every cut on each side of the track, that it can neither be moved back further by the wings of a push plow nor reached by a rotary. Each additional snow causes anxiety, for there is little or no room in the cut for it. The usual last resort in such cases is the extra gang, the pick and the shovel, the boarding train and—large expense. Blocks of hard snow, loosened from the slopes of the cut, may be utilized at the right of way boundary for snow fence building material.

This troublesome hard snow is easily handled by means of the crab, which was conceived as the result of the well-known difficulty of backing a wingless "V" shaped plow through a snow cut which it has just been pushed through nose first. There is a decided tendency for the snow just winged back to catch the spread of the plow and to roll onto the track under the wheels and derail or stall the plow. It is often necessary to go ahead a long distance to a turntable or wye where the plow may be turned for the return trip. The crab is constructed to pull this snow from the cut slopes into the center of the track where it may be handled by the rotary plow. Imagine a push plow with wide spread wings, and minus its nose. The inside surfaces of the wings are finished as working surfaces. The vertical heel edges of the wings are bevelled toward the track center and are steel shod. These wings converge only as far as the rails. The track space is clear, the nose of the plow being left out while the wings are joined with steel bars and braces. This crab is framed at the end of a flat car, each wing being preferably controlled by air independent of its fellow. The crab with wings extended is backed through a narrow, snow bound cut, the bevelled heel edges scraping the hard snow from the slopes toward the track center behind the car trucks, from which position it is picked up with the rotary.

The effectiveness of snow plows depends largely on the knowledge and application by the manipulator of those many small practicalities ordinarily learned by experience only. Many locomotives of northern railways are equipped in summer with hose to be used in fighting forest fires. This hose may be advantageously used, when attached to a valve placed on the steam dome of the snow plow engine, to thaw the ice from engine and plow, from trucks and frames and the cogs of gear wheels. All this may be done in the few minutes necessary to get orders and water or to take a sidetrack at a meeting point. If no steam hose is available and the gears are frozen and slipping a poker heated in the snow plow stove may be used in thawing ice from the cogs.

Great care should be exercised in backing winged plows around wyes and curves, to make sure that the shoes of the wings do not come in contact with high ice, hard snow or other obstacles alongside the track which will strain the hangings of the wings and put the plow out of commission. Supplies of good alcohol and waste are necessary to keep frost and snow from obscuring the vision of lookouts through the lenses of snow plow port holes. It requires concentration of mind, a quick eye, a sure hand, good judgment of speed and distance, and plain signals successfully to operate a snow plow. Plows and flangers should be carefully blocked up and the wings of plows locked or chained in the closed position before being moved by trainmen, when unattended by persons familiar with the handling of such equipment and specially detailed for the work.

The side leveller, such as is used to level earth in the construction of double track grade, is a great money saver where snow ridges exist between main and parallel side tracks, or even in yards, if it is possible to get the tracks clear of cars so that the snow may be removed successively from one to another and finally deposited beyond the outside track at one side of the yard. The only alternative is the road train.

The "V" shaped, air controlled, flat car flanger is really a wingless snow plow equipped with flanging shoes. This flanger is of especial benefit in keeping down the snow in the center of the track. Nothing is more feared by the snow handler than what is known as hard center. The sudden freezing of wet snow allowed to remain high in the middle of the track creates a condition which can only be remedied with the pick and shovel. Such a method of clearing all the tracks for 75 to 100 miles of the length of a railway means immense expenditures, and is to be avoided even if traffic must be impeded or suspended while flangers are sent over the line. Once frozen such track is beyond the control of any snow handling equipment. The Priest flanger and similar track flangers, which may be yoked over the rear wheels of the pony truck of a locomotive, or used under a special car, are valuable in light snow to keep the track clear between the rails for the space of about 12 in. adjacent to each rail. The flanger shoe is preferably made from soft, thin iron plates which will bend rather than break on contact with any immovable obstruction, such as a high tie or crossing plank spike, or flange rail. A bent shoe may be hammered back into place in a few minutes by the flanger attendant, while a broken or missing shoe puts the flanger out of service till repaired in the division shop. Engines equipped with flangers and good pilot plows will handle snow of considerable depth. Many branch lines and logging roads use this equipment exclusively in localities where the snow fall during the winter totals several feet.

Fast running is essential to the proper clearing of track of snow with winged push plows: that is, the speed should be 35 miles per hour or more, for medium to heavy snow. Very light snow, on the contrary, cannot be so handled. It will rise in clouds, swirl in behind a rapidly moving plow, covering the locomotive and caboose and finally settling on the track. A slowly moved "V" plow having old style, vertical, wide spread wings will often rid the track of very light snow to the best possible advantage. It is frequently advisable to send out extra gangs and boarding trains to stations where cars are buried badly in snow on sidings in order that the laborers may shovel snow from under cars to which the plow has approached, before the cars can be released one to four at a time. At such times, chains, cables, blocks, shovels, picks, brooms and wrecking lights are indispensable.

There is one really good, and many poor kinds of rattan brooms for railway use. The section man's best broom is short, thick and stout; made of whole round rattan only, the straws threaded together low down, with fine wire. The handle ends in a steel spud are useful for loosening hardened snow and ice from between rails and switch points. Without this spud the broom looses half its efficiency. The round rattan broom costs only 10 to 12 per cent. more than the split bamboo or

rattan, and the gain in efficiency is not less than 90 per cent.

Salt for railway use should be fresh, of good quality and strength, and free from large lumps.

Handcar brooms are fixed by holders in front of the handcar wheels and over the rail in such a way as to sweep the snow from the rails ahead of the wheels, and so prevent slipping.

Track shims are flat, rectangular blocks of hardwood, ordinarily 5 in. x 9 in. and from ⅛ in. to 1 in. thick. They are purchased in bundles of about 100 each, tightly pressed in bales some 30 in. in length. Shims are used to place on top of ties under the track rails to equalize temporarily differences in elevation due to expansion of ballast resulting from the action of frost. Rail braces of wood or iron are used in connection with shims to guard the safety of track, the rails of which have been blocked up off the ties as described. Second-hand spikes are again used to fasten braces to the ties.

The handling of snow and ice is the largest item of expense of the maintenance department of nearly every northern railway in winter. Directly and indirectly a large portion of the total expense of the whole road may then be charged to snow and ice.

Section gangs' duties include the track patrol, the care of outlying switch and semaphore lamps, the keeping clear of snow and ice of all switches and crossings, shovelling snow from such tracks and crossovers as cannot be plowed, shimming rails, and such other routine work as is expected of them the year round. In late winter and early spring, the brush is cut away from right of way fences and such fence repairs are made as are necessary and possible.

Continual vigilance is required to detect and repair and replace broken rails and splices; to keep snow off the lenses of semaphore and switch lamps; to keep ice from freezing too high between rails at standpipes and track tanks. With good tools and prompt tool repairs, an adequate force of section men well paid is a true economy. With indifferent tools or delayed repairs, reduced force or poor wages in winter, only the reverse is possible.

A condition peculiar to northern railways during severe winter weather is the backing up of water over the frozen track due to the freezing of rapid streams and the formation of ice gorges. The expansion of heavy ice in lakes or rivers has been known to push out of line railway tracks built close along the shore. The great force of expansion causes the ice to push the ballast to the tie ends and sometimes to actually push the whole track seriously out of line. The difficulty may be remedied by sawing a trench through the ice parallel to the roadbed and placing timber skids under the ice of the main ice field so that any further expansion occurring will cause the ice to rise on the skids over the shore ice. This overlapping will, of course, provide ample room for all future expansion.

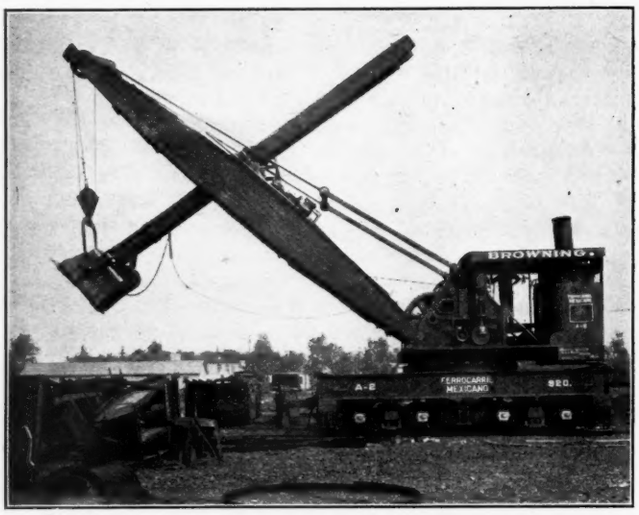
The prevention of trouble to a railway from snow should commence with the location survey. The grade should be so located that it will be at least two feet above the general ground level. Further immunity may be had by judicious widening of cuts, flattening of slopes and placing of spoil banks. When a storm does come, the road is best kept open by instant cessation of freight traffic of the class which can be safely sidetracked at the nearest station.

Snow plows and flangers must be run and kept running ahead of passenger trains until the storm abates, even though schedules are violated by waiting for the snow equipment, to precede the trains. It is best in severe snow storms to make haste slowly and surely. This procedure is admittedly expensive and regrettable. It is adopted with reluctance as the lesser of two evils. The inexperienced operating officer on a northern road will do well to accept the advice of the older men during his first winter season at least. There is much to learn about snow handling, which may be best learned by persistent inquiry, ready acquiescence, and constant observation. As there never are two wrecks precisely alike there are likewise no two storms exactly similar, and judgment is required to manage each battle along the proper strategic lines.

SELF-PROPELLING WRECKING CRANE AND STEAM SHOVEL.

A new self-propelling wrecking crane, with a steam shovel attachment, has recently been built by the Browning Engineering Company, Cleveland, Ohio. The first one of this type which was built for the National Railways of Mexico is shown in the accompanying photographs. The machine is of heavy construction, the main hoist having a capacity of 100 tons, and the auxiliary hoist a capacity of 25 tons.

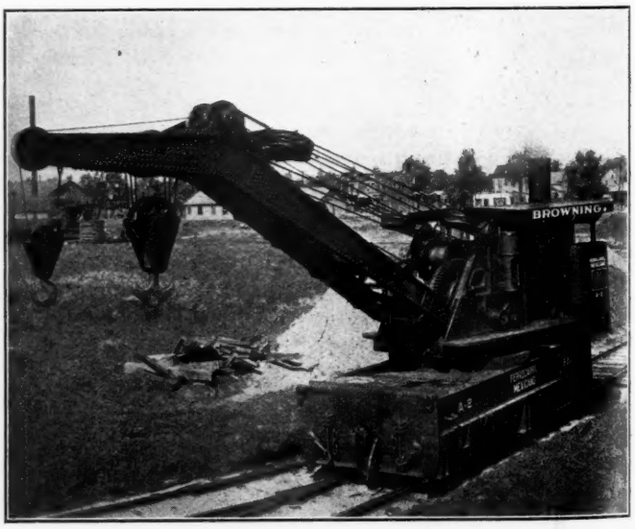
The steam shovel attachment is of special advantage on a single track road running through a mountainous country where



Wrecking Crane Equipped with Steam Shovel Attachment.

landslides are frequent. Owing to the wide radius of the shore it is well suited for such emergency work, as it can dig straight ahead and deposit the dirt in a car to the rear. Having a maximum radius of 45 ft., it is enabled to load a 42-ft. flat car without difficulty. The change from a wrecking crane to a steam shovel can be quickly made in the shop where handling equipment is available. The boom is fastened to the rotating base and side housings by a shaft held in place by cotter pins. One boom is disconnected, and the other substituted by simply taking out this shaft.

The rotating base is a single open-hearth steel casting, which supports the machinery and structural platform on each side of the crane, and the platform allows the operator to reach any part of the machinery without leaving the cab. All operations of the



Browning Wrecking Crane Equipped for Wrecking Work.

crane, as well as the firing and attendance of the boiler, are controlled by one man on this platform. Side bearing wedges of steel castings, operated by a handle, are pulled out, transmitting the side bearing pressure directly to the arch bar frames when the crane is in operation. When the crane is in transit these wedges are pushed inward to take the load from the body bolster and transmit it to the truck bolster springs. The propelling mechanism can be disconnected immediately by a jaw clutch when it is necessary to run the wrecker in a train.

In reaving up the steam shovel attachment, the hoisting line for the dipper is connected to the auxiliary hoist drum, which gives it a faster operation.

The truck is mounted on eight 33-in. wheels having M. C. B. tread. The width of the car frame and rotating frame is 9 ft. 6 in. The maximum height above the rail is 15 ft., and the length of boom is 28 ft.

The capacity of the main hoist with all outriggers is 100 tons at 17-ft. radius, and 70 tons at 20-ft. radius. The auxiliary hoist has a maximum capacity of 25 tons at a 25-ft. radius and 15 tons at a 15-ft. radius. The speed without load is as follows: main hoist, 10 ft. per minute; auxiliary hoist, 50 ft. per minute; rotating, one revolution per minute; traveling on level track, 400 ft. per minute. The wrecker is designed to travel around a curve of 75-ft. radius and to climb a 5 per cent. grade.

PRIZE SYSTEMS IN TRACK WORK.

The promotion of efficiency in track work by awarding prizes for the best maintained track, or for the greatest improvement made in a given period, is not new, but it is receiving more attention from year to year as operating men realize the necessity for encouraging proper interest in maintenance work. The Pennsylvania Railroad is the pioneer in this field, its thirty-ninth annual inspection having been made last fall. Among other roads, the Pennsylvania Lines West, Union Pacific, the Erie and the Rock Island have adopted similar plans.

PENNSYLVANIA RAILROAD.

The Pennsylvania Railroad offers more and larger prizes than the other roads. This year the prizes were awarded upon the basis of frequent inspections made during the year by a special committee, composed of Joseph T. Richards, chief engineer maintenance of way, chairman; L. R. Zollinger, engineer maintenance of way; Elisha Lee, assistant to general manager; L. B. Baker, superintendent Philadelphia terminal division, and E. B. John, superintendent Delaware division. This committee made trips every six weeks over the main line between Pittsburgh and New York, on which the principal prizes were awarded, and notes were taken on each trip of the condition of each section of track. In the fall the general manager and staff made an inspection trip over the main line, and while the prizes were awarded immediately after this trip, they were, in reality, based upon the records kept by the committee. On this general managers' inspection, all general superintendents and their staffs, including the superintendents, division engineers, supervisors and assistant supervisors, accompanied the party. Two days were consumed in the trip from Pittsburgh to New York, and the party of between 300 and 350 men was carried in six special trains. Three committees judged the conditions of the track and right of way. One committee marked on line and surface, one on spacing ties, ditching and drainage, and one on telegraph lines and signals. A new feature introduced was that of sending half the division engineers on the lines east of Pittsburgh on the inspection trip of the lines west and taking half of the western division engineers on the inspection east of Pittsburgh, in this way giving the men an idea of the conditions on other parts of the system. The largest prize consists of $800 for the supervisor and $400 for the assistant supervisor, and is awarded to those men on the sub-division maintaining the best line and surface during the year on the main line between Pittsburgh and New York. This prize was awarded last fall to C. M. Wisman and William F. Miller, respectively, in charge of track between Tullytown, Pa., and Deans, N. J. Four division prizes of $600 and $200 are awarded the supervisors and assistant supervisors having the best track on the four superintendents divisions. These prizes were awarded to John Schimmel, Jr., supervisor, and H. A. Gass, assistant supervisor, in charge of track from West Philadelphia to Coatesville; D. T. Easby, supervisor and R. S. Stewart, assistant supervisor, in charge of track from the east end of Rockville Bridge to Thompsontown, Pa.; George Ehrenfeld, supervisor, and G. W. Curtiss, assistant supervisor in charge of track from the west end of Altoona yard to Portage, and George Goldie, Jr., supervisor, and N. D. Vernon, assistant supervisor, in charge of track between West Philadelphia and Wilmington, Del. In addition, a special improvement prize of $700 and $300 is awarded the supervisor and assistant supervisor on the sub-division on which the greatest improvement was made during the year. The prize went to F. W. Schneider, supervisor, and F. M. Robb, assistant supervisor, between Huntingdon, Pa., and Altoona yard. Also, on each general superintendent's division a prize of $100 was awarded to the supervisor having the best track on branch lines, the reward being based on the result of the general superintendent's inspection.

PENNSYLVANIA LINES WEST.

The Pennsylvania Lines West have adopted a similar plan, although the prizes are smaller and are awarded entirely on the results of the general managers' annual fall inspection. Two committees were appointed by the general manager, each consisting of two superintendents, two division engineers and two supervisors, who mark the different sections for conditions of line and surface, right of way, etc. First and second prizes of $200 and $100 are awarded to the supervisor and the track foreman having the best sub-division, the award being based solely on line and surface. A third prize of $150 is awarded to the supervisor having the best sub-division, the award being based on all points, and a fourth prize of $50 is awarded to the track foreman on each supervisor's sub-division having the best section, considering all points. Twenty-three such prizes were awarded to foremen of the respective sub-divisions. The first prize of $200 was awarded to L. M. Berlin, supervisor of sub-division No. 3 of the Western division; the second prize of $100, to W. F. Rosenbaum, track foreman on sub-division No. 4 of the western division; and the third prize of $150 to D. Callahan, supervisor of sub-division No. 2 of the eastern division. During the past year this inspection covered the main line of the Southwest system from Pittsburgh to New York and the main lines of the Northwest system from Chicago to Pittsburgh.

ERIE.

The Erie awarded a first prize of $200 and a second prize of $100 to the supervisors on each of the two operating grand divisions for the best and second best maintained sub-divisions on the main line. The foreman having the best section on each superintendent's division was awarded a first prize of $100, with a prize of $50 for the second best section. Similar prizes were also awarded the supervisors and foremen on branch lines, but in some instances the branch line prizes for foremen were $50 and $25, respectively. In addition to this, the foremen having the best and second best sections in each grand operating division received prizes of $100 and $50, respectively. The award of these prizes is based largely on the result of trips made with a track inspection car over each section near the beginning and the end of the working season. The physical conditions surrounding the work, the cost of labor and the amount of material used, also enter into the making of the awards. The supervisors' prizes on the eastern grand division main line were awarded to W. J. Flynn, supervisor from Waverly, New York, to Corning, and W. J. Connelly, supervisor from Wellsville, New York, to Hinsdale, while the prizes on branch lines went to L. B. Shaffer, in charge of track from Plains Junction, Pa., to Jessup, the

second prize to E. Madill in charge of track between Avon, N. Y., and Mount Morris. On the western grand division the main line prizes were awarded to A. Burgett, Ohio City, Ohio, to Rochester, Ind., and J. E. Fletcher, Ashland, Ohio, to Marion. Branch line prizes were awarded to Charles Pierson, Salamanca, N. Y., to Union City, Pa., and Nathan Flack, Cleveland, Ohio, to Garrettsville.

ROCK ISLAND.

The Rock Island Lines inaugurated a system last year by which premiums were awarded to roadmasters and section foremen on certain main line districts and sections, on the basis of improvements made during the year. Certain definite weights were given to line and surface, drainage, etc., in the consideration of the awards. Committees were appointed from each of the general managers' districts, and inspections were made at the beginning of the season's work and again at the close. A prize was awarded to the roadmaster whose work showed the greatest improvement on a division or group of divisions, while a premium of $50 was given the foreman making the greatest improvement on each roadmaster's sub-division. A total of $3,825 was awarded in prizes, of which $1,485 went to roadmasters. The roadmasters to whom prizes were awarded were: J. L. Jensen, Bureau, Ill., to Davenport, Ia.; J. Hayes, Davenport, Ia., to Grinnell; A. Burke, Altamont, Mo., to Horton, Kan.; G. Tjaden, Cedar Rapids, Ia., to Estherville; G. Flora, Estherville, Ia., to Sioux Falls, S. D.; J. Dulin, Des Moines, Ia., to Keokuk; V. B. Simpson, Belle, Mo., to Windsor; Wm. Broddle, Herington, Kan., to Caldwell; C. B. Lane, Goodwell, Okla., to Texhoma; J. L. Hayes, Fairbury, Kan., to Phillipsburg; J. D. Sullivan, Goodland, Kan., to Colorado Springs, Colo.; J. H. Trainor, Little Rock, Ark., to Boonville; G. W. Woods, Eldorado, Ark., to Winfield, La.; F. E. Watson, Haileyville, Okla., to Ardmore, and W. H. Gruhlkey, Shawnee, Okla., to Sayre.

It is interesting to note that two of the section foremen's prizes on the southern divisions were awarded to colored foremen.

OTHER ROADS.

The Union Pacific has maintained the practice for several years of awarding a medal to the roadmaster, maintaining the best track on his sub-division of the system and another medal for the section foreman having the best track on each subdivision. Prize sections are also indicated by signs placed at the section houses.

Other roads have followed this premium plan, although the above-mentioned ones are the more important. The Bessemer & Lake Erie has adopted a plan of taking the section foremen over the road on the annual track inspection, so that they may see for themselves how the different sections compare. Two years ago an innovation was made when not only the track of the home road was inspected, but the party made a trip over the Pennsylvania main line between Pittsburgh and Altoona. The following year this trip was extended to Harrisburg. Last year after making the trip over its own line the party was taken over the main line of the Lake Shore between Erie and Buffalo.

All of these plans are of direct value to the track men, and the results are reflected in more intelligent work and greater interest. Any method which encourages a proper spirit of rivalry increases the output of work, and when this increased work is rewarded by cash prizes to the men these prizes stimulate them to increased output, because of this value as well as the honor. For this reason, cash prizes are generally believed to be more effective than medals. While it is true that good results are secured on the Union Pacific, and that the foremen who have won medals are very proud of them, the average native foreman prefers cash, which will meet some definite want, and the same honor can be secured by a small marker placed on the section.

One tendency noticeable in some instances where prizes are awarded on one fall inspection is that of speeding up the work shortly before the inspection and allowing it to go down after the inspection has been made. This is overcome by the plan adopted on the Pennsylvania Railroad of making periodical inspections through the season, which tend to maintain the standard of track work during the whole year. The practice of taking the foremen over the line is most commendable, because it broadens their view of track work. On the roads where this custom has been followed the men look forward with pleasure to the trips from one year to another. It is interesting to note that the roads on which these methods are in use are among those giving the most attention to track work, and, for this reason, their experience should be instructive.

MALLEABLE IRON TRACK FASTENINGS.

The economy in the use of tieplates is now generally recognized. There are many and varying opinions, however, regarding both the design and the material most suitable for tieplates. The greatest difference of opinion regarding design relates to the kind of projections, if any at all, to be placed on the bottom of the plate. As regards the kind of material, it is interesting to note the increase in the use of malleable iron. Extracts from letters on this subject from prominent railway engineers were published in the *Railway Age Gazette* of December 9, 1910.

This material has come into use rapidly in recent years, the first plates being made of malleable iron about ten years ago. From the nature of the material it must be cast instead of being rolled, and for this reason the malleable plate is more expensive than the rolled plate. An advantage, however, is its resistance to corrosion, which action takes place everywhere to a greater or less degree, and is a factor to be considered in all localities of normal rainfall. While perhaps slow, the corrosive action of moisture is nevertheless continuous, and its effects become evident in time, so that it must be given weight in the design of the plate either by the use of a heavier section or by the adoption of a material that resists corrosion. Corrosive action takes place in all degrees from that due to ordinary moisture to that due to brine drippings from refrigerator cars, which is the most severe action commonly met with. Corrosion resulting from brine drippings has become very serious in recent years on railways where the amount of refrigerator traffic is heavy, and has given rise to a great deal of discussion and study, especially on the part of the Master Car Builders' Association. The recommendation of this association that these drippings be collected in tanks will, if followed out, undoubtedly tend to reduce this damage substantially, but can hardly be expected to eliminate the trouble entirely. Even at best it will be several years before the necessary changes are made in all the cars.

With the constantly increasing tendency toward a more permanent track construction, evidenced in the use of treated ties with a life of from 12 to 15 or more years, the beginning of the use of screw spikes, etc., the use of malleable iron plates is increasing in proportion. A promising field for this material is developing in connection with the use of screw spikes, where the plate is largely cast rather than rolled to secure the irregular supporting lugs under the head of the spike, which some roads consider necessary.

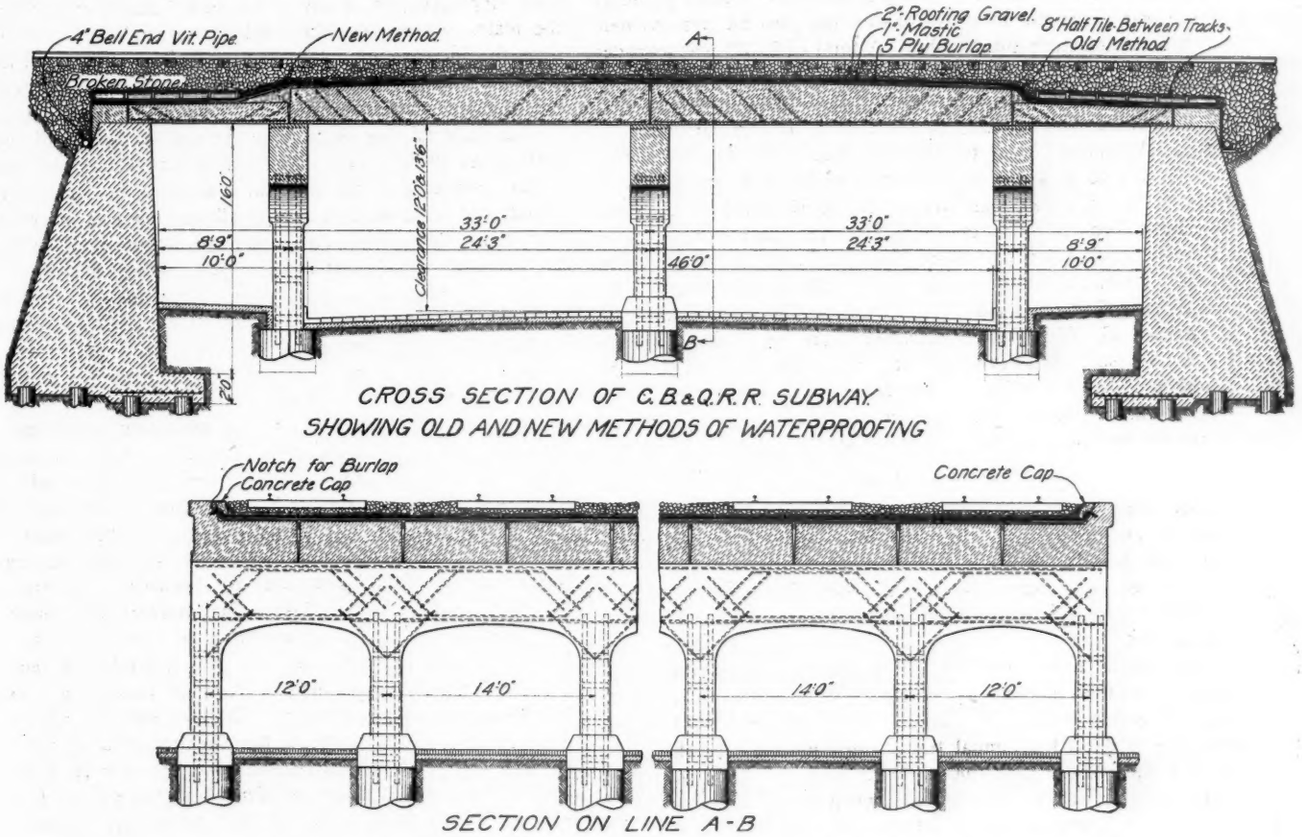
Many malleable iron tieplates have now beeen in service from eight to nine years and are showing little signs of wear or deterioration. The Chicago, Milwaukee & St. Paul has been one of the largest users of them, and last summer removed over 100,000 from the track, repunched them for a different weight of rail, and put them back into service. The Chicago, Rock Island & Pacific and Atchison, Topeka & Santa Fe are among other roads which are using them extensively on lines of heavy traffic.

The work on the second section of the North Coast Railway, New South Wales, is proceeding satisfactorily. It is reported that the contractor expects to have a tunnel through Stroud Hill holed through shortly. Rails are now laid from Dungod to Washpool, near Stroud.

WATERPROOFING CONCRETE STRUCTURES ON C. B. & Q. TRACK ELEVATION.*

BY G. A. HAGGANDER,
Office Engineer, Bridge Department, C. B. & Q., Chicago.

One of the hardest problems presented in connection with the construction of the concrete subway track elevation of the Chicago, Burlington & Quincy in Chicago is the waterproofing. These subways are constructed with concrete slabs or girders 7 ft. wide, built away from the work, resting on concrete abutments at the street lines and on concrete columns and cross girders at the curb lines and center line of street. There is a joint between the slabs longitudinally across the bridge, also one over each cross girder and one at the bridge seat on top of the abutment. The slabs over the street are 2 ft. 9 in. thick over the street girder and 2 ft. 6 in. thick over the curb cross girder.



Standard Method of Waterproofing Subways; C. B. & Q. Track Elevation Work, Chicago.

The slabs over the sidewalk are 1 ft. 5½ in. thick over the curb cross girder and 1 ft. 2½ in. thick over the bridge seat.

The first waterproofing was done in 1906. The most natural method seemed to be the closing of the joints. In order to do this the first slabs were built with the sides offset as shown in Fig. 1. The open space between them after they were set was ¼ in. at the lower part and 1¼ in. at the upper part. A board was put under the joint where the bridge seats did not prevent the mortar from leaking through and the ¼-in. space was filled with cement grout to within 1½ in. of the offset. The next 3 in. was calked with oakum soaked with an asphaltic compound. The rest of the opening was filled with cement grout and over the entire joint were placed three layers of felt painted with this compound.

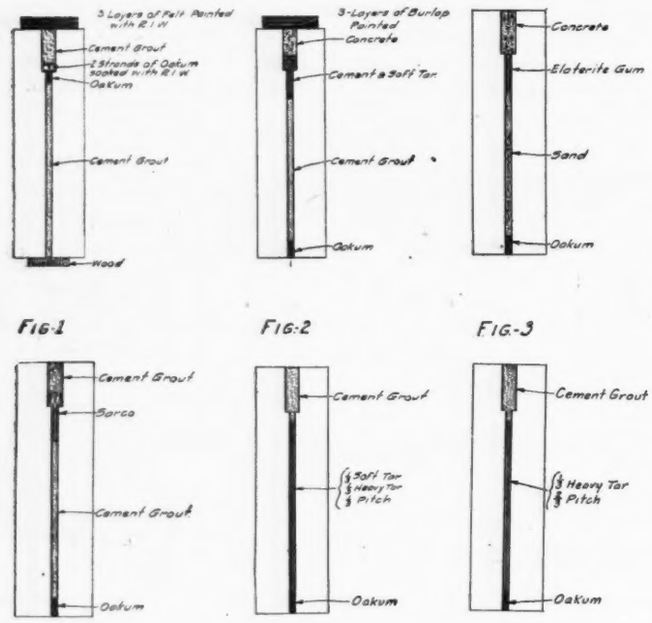
This method was not effective, the subways leaking very badly. It did not prevent the water behind the abutment from running through the mortar joint down the face, and the joints cracked open, letting the water through. It was thought best to fill the joints with some elastic material and six schemes were tried as shown in Figs. 2 to 7 inclusive. They consist of different arrangements of oakum, cement grout, tar or some asphaltic compound and sand. In every case the bottom of the crack was calked with oakum to prevent having to use boards under the joints. None of the methods were even partly successful until the sixth was tried. This one failed when the tar leaked out through the oakum, but this was prevented to a great extent by the use of sand above the oakum. At first the joints were water tight, but the jar and slight working about of the slabs loosened the oakum, letting the sand and tar escape. The joint at the abutment also leaked very badly. In addition to this the water found its way through two of the slabs themselves.

These methods had been tried during 1906 and 1907, and in 1908 it was thought best to waterproof the whole surface of the bridge and to aid the water in running off by a system of drain pipes.

The method shown on the right-hand side of Fig. 8 was the one adopted. The slabs were built with a ½-in. batter on the sides instead of with an offset so that they could be calked from above. After calking the cracks with oakum they were filled with cement grout. The vertical offset of 12½ in. over the curb cross girder was rounded off by a fillet of concrete. The abutment back of the bridge seat was built up to the level of the top of the sidewalk slab. The lifting stirrups or hook bolts by means of which the slabs were placed were cut off at the top of the concrete and the surface of the bridge swept clean. As a rule only one track or a width of 14 ft. could be waterproofed at one time because of operating conditions and the fact that the force used was of such size that this was one day's work. A strip about 4 ft. wide was mopped with a coat of asphalt which had been heated to the melting point. Four kinds of asphalt were used at different times, Sarco No. 6 and No. 651, melting point 160 deg., Barber Asphalt Company's positive deal

*The Armour Engineer, January, 1912.

"A," melting points 140 deg., Texaco and Warren Chemical Company's asphalt cement. On this was put a strip of 8-oz. open-mesh, first quality burlap, 42 in. wide. This came in 2,000-yd. bundles and was made into rolls coiled on a 1½-in. gas pipe 7 ft. long. It was applied by starting at one end of the bridge and rolling it across. A man followed the roll and swept out any wrinkles so as to give a smooth surface and bond it to the asphalt below. The top of this burlap and a strip of concrete about 15 in. wide on one side of it was then painted with hot asphalt and another layer of burlap laid, covering two-thirds of the first layer, the rest lapping over on the concrete. This burlap and the adjacent concrete were then painted and another



Methods of Waterproofing Joints in Subways.

strip laid covering one-third of the first and two-thirds of the second strip. In this way the burlap was made three-ply. Care had been taken that the temperature of the asphalt was not high enough to burn the burlap. A melting point of 160 deg. Fahrenheit gave the best results, as asphalt with a higher melting point burns the burlap and it becomes more brittle at low temperatures. After three-ply of burlap had been laid the whole surface was again mopped with asphalt and a protecting layer of mastic put on. This layer consisted of one part of asphalt and four parts of dry engine sand. The asphalt was heated to the melting point in one kettle and the engine sand heated over an iron plate. They were mixed and stirred in another kettle until of the right consistency, a slow fire under the kettle keeping the mixture plastic. This mastic was dipped into iron wheelbarrows, wheeled on broad runways laid on the burlap, dumped, and finished with wooden trowels to a thickness of 1 in. The top of this mastic was mopped with asphalt. This 1-in. layer was not intended to aid in waterproofing, but was put on to protect the burlap from the ballast and track tools.

The drainage system consisted of inverted 8-in. half-tiles laid between each track leading from the hump over the curb cross girder to the back of the abutment. Back of the abutment and about 1 ft. below the bridge seat a board was placed on which rested another 8-in. half-tile. The end of the burlap rested in this and another 4-in. tile was laid in it. The tiling was given a slope of about 1 per cent. toward down-pipes. These down-pipes were 50 ft. apart and ran down the back of the abutment to the sidewalk level, then through it and under the sidewalk to the gutter. The mastic was protected by ¾ in. of roofing gravel to keep the sharp edges of the crushed stone ballast from cutting into it. The crushed stone ranged from ½ in. to 2½ in. and was used to allow free movement of the water through it.

It was not long, however, before the boards and tiling crushed down into the newly made fill, giving no means of escape for the water which ran off the bridge, causing it to back up above the level of the bridge seat and find its way down the face of the abutment. This was prevented by building the concrete so as to overhang the back of the abutment about 1 ft. and letting it run down the back about the same distance. The top of the abutment was painted with a heavy coat of tar paint before setting the slabs. This effectually sealed the joint. In all abutments built after this experience a notch was left in the top, as shown on the left hand side of Fig. 8, in which to place the tile and prevent its crushing down.

After the first year's experience with this waterproofing, it was thought advisable to increase the thickness of burlap to five-ply. Many leaks had developed over the curb cross girder due to the tearing of the burlap over the hump at the cross girder joint. This seemed to be caused by a slight expansion and contraction of the slabs and tendency of the waterproofing to travel down the slope of the hump due to the load of an engine above it. The crack which opened up was sometimes as wide as ¼ in. Some method of allowing for this had to be used so a 1-in. pipe was laid over the joint, the burlap put on in the regular way, the pipe withdrawn, and the mastic applied. This scheme was used on all work during the year 1909 and thereafter. Another precaution was taken by putting a flatter slope on the hump, the concrete being run out about 3 ft. 6 in., so that the tendency of the waterproofing to slide down was diminished. The bridges waterproofed during 1909 are almost devoid of leaks.

The bridges which were waterproofed by filling the joints, in 1906 and 1907, have since been waterproofed by the latter method. Those which were waterproofed during 1908 developed leaks where the waterproofing cracked and repair work was started during the fall of 1911. In this repair work the mastic was chipped off for a distance of 8 in. each side of the crack. The burlap was cut away from the crack to the edge of the mastic on the street slab. A 1-in. pipe was then laid over the joint and the mastic and the burlap on the street slab lifted up so that a new strip of burlap could be inserted under it. It was lapped under about 9 in. and then laid over the old burlap on the slope. Five-ply were laid, each painted with asphalt, the pipe withdrawn (thus allowing for expansion), and new mastic put on.

Records have been kept of the dates when different portions of the bridges were waterproofed. This repair work has shown that during the cold weather the asphalt that is applied to the cold concrete becomes chilled and does not penetrate the burlap which is laid on it. If the weather was very cold, even the coat which was mopped on this first layer of burlap did not penetrate it, due to the fact that the cold concrete had chilled it. The second layer of burlap seemed to have been pretty well saturated

in all cases, while the third layer was thoroughly saturated. In waterproofing which was laid during warm weather all of the burlap was in a good state of preservation, having been well saturated with the asphalt. The mastic seemed to protect the burlap very well, although in some cases track tools had penetrated it, causing leaks. The smaller sizes of crushed stone of about ½ in. did not penetrate the mastic as much as the larger sizes on account of the more uniform bearing.

The average force used on this work consisted of:

1 foreman	at	$.33	per hour.
3 finishers	at	.25	per hour.
1 kettleman	at	.27½	per hour.
8 laborers	at	.20	per hour.

These men waterproofed a bridge 14 ft. wide and 75 ft. long, or 1,050 sq. ft. per ten-hour day. The average cost of the later waterproofing was a little less than 14 cents per sq. ft, for the burlap and the mastic, not counting the concreting over the hump and bridge seat and the filling of the joints with mortar. This work was done by another gang the day previous to the waterproofing. It added about three cents per sq. ft. to the cost, making a total of 17 cents.

This work was done under the direction of C. H. Cartlidge, bridge engineer, and L. J. Hotchkiss, assistant bridge engineer, and was directly in charge of F. H. Cramer, by whom much of the material in this article was furnished.

WINTER WORK ON TERMINALS.

BY F. E. CRABBS,

Roadmaster, Chicago & North Western, Chicago.

The largest individual terminal in the city of Chicago, and one of the largest in the country, is that of the Chicago & North Western. In order to handle trains promptly and keep them moving without delay it requires system and organization on the part of the roadmaster to handle a terminal of this size. The continued cold weather of the past month emphasized very strongly the necessity for having the tracks in excellent condition to maintain traffic regularly during such a cold snap. Because of the size of our terminals, the variety of problems presented and the intensity of traffic, our experience may be of value to others.

In order to go through a winter successfully it is necessary that the tracks be put in good condition before the ground freezes. All switch ties which it is necessary to renew are changed out early in the summer, and all parts of the track are put in good shape, so that after September 1 the attention of the track force can be devoted to preparing the track for the winter. All tracks, especially through leads, turnouts and switching ladders, are carefully surfaced and lined, all guard rails are adjusted, and debris is carefully cleaned out around all switch rods. All lead rails are tie-plated, for we have found that the tie plates not only hold the leads to gage and prevent the canting of the rail, but also render braces and tie rods unnecessary. Our terminal is laid with 90 and 100-lb. rails, and a large number of manganese frogs are used. We think the manganese frog has proved its efficiency, and can no longer be considered an experiment. We have manganese frogs which were installed in the old Wells street passenger yard three years ago, and which have not cost us a dollar for maintenance since that time, and now show very little wear. The life of Bessemer rail frogs in the same places was only four months. Owing to the rigidity of the manganese frogs the track forces must be very careful to see that the guard rails are placed the proper distance from the main rails when installing these frogs. This is especially true where the gage of the track is widened through the frogs, because of sharp curvature in the turnouts. If the guard rail spacing is not changed in this way the wheels will strike the wings of the frogs with severe injury to the wheel flanges.

In former days considerable trouble was experienced in holding to gage the curved rail of slip or puzzle switch which rest on the riser plates. This has been overcome by having the riser plates constructed with a shoulder similar to that on a tie plate.

When a large amount of emergency becomes necessary, as immediately following a heavy snowfall or during excessively cold weather, large forces of extra men must be put on. The men employed for this purpose are recruited largely from the ranks of those who have been on extra gang work during the summer and who spend their winters among the municipal lodging houses. Free employment offices are opened by the company when the need for men arises and are kept open both day and night. Gangs are recruited through these offices and from the municipal lodging houses and are put to work. A new departure was made this winter when timekeepers for these gangs were secured from the accounting department. These timekeepers distributed among the men buttons similar to the common extra gang buttons, except that they were marked "snow." When work is completed the timekeeper takes up the button and gives the laborer in exchange an identification card to take to the paymaster for his money. The buttons are used only once and are then destroyed. The practice of handling the timekeeping directly through the accounting department rather than through the office of the roadmaster, whose clerical force is limited, has been found to work very satisfactorily. As the men are "floaters" and have no regular place to eat the railway has found it necessary to feed them while they are working. Cars have been fitted up for a kitchen and diners, and are distributed through the various yards, where they are employed. By giving them hot meals much greater efficiency is secured.

Snow melters have been installed at various places in the new passenger terminals. These are constructed of concrete, and are about 4 ft. x 10 ft. in size and 18 in. deep. Perforated steam pipes leading directly from the power house are located in the bottom of these concrete boxes. During snow storms the snow can be melted in these melters as fast as a large gang of men can carry it to the pits. This saves much labor loading snow into cars, and the water is rapidly conducted from the melters into the sewers.

At the Western avenue crossing we are using hydro-carbon for melting the snow, and find that where there is proper drainage its use has proved successful. This fluid comes in 50-gal. tanks, and a rack set 2 ft. above the ground has been provided for four tanks. Special cans, holding two gallons each, are used in applying the liquid to the track. These cans have nozzles which are reduced to ⅛ in. and are opened and closed with a valve. When ready for use the valve is opened and the fluid lighted; and it starts melting the snow. Any section man of ordinary intelligence can handle this safely, and one man with a can of the fluid can accomplish more than ten men with brooms. It has been found that the heat from the fluid has no injurious effect on the rails.

An experiment last tried on our terminals this year was to dip the rattan snow brooms in common, hot, black oil before using. We have found that this results in from one-third to one-half greater wear from the brooms. The oil prevents the water from collecting on the broom and freezing, and makes the broom more pliable. By actual test we have found that a rattan broom costing $2.85 per dozen, if dipped in this oil before using, gives better results than one costing $4 per dozen, if not so treated. As our expense for snowbrooms alone exceeds $3,000 annually, this means a big saving.

One of our regular section men is assigned as night track walker at each interlocking tower during the winter. It is this man's duty to look after switches and to call the section men in case of an accident or a snow storm. This not only saves delay, but the one man can frequently repair a broken switch alone and save calling out several men.

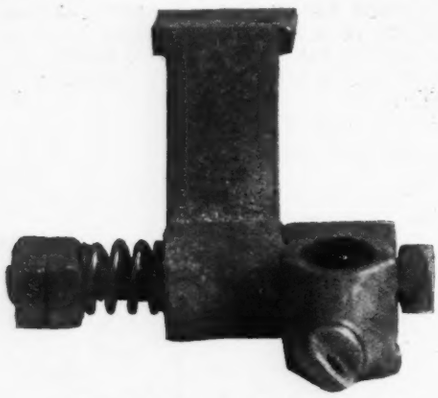
One of the most respected and important committees on the Chicago & North Western today is the Safety Committee. During the past year there have been 32 per cent. less accidents to the section men alone than during the previous year. In order to interest the foremen and laborers on the terminals in this movement a Safety Committee has been appointed from the

track forces, and on various dates during the month these men make inspections over the entire terminal with a view to finding any defects and making a report to the roadmaster. Where any defects are found he goes on the ground immediately and sees that the foreman makes the necessary repairs. The report of this committee is not a criticism of the foremen for being able to see every defect, but rather an implied criticism of the roadmaster for not being able to see the defects which the individual foremen do not find. It is surprising to note the marked improvement made as a result of this committee's work.

HAND CAR BROOM HOLDERS.

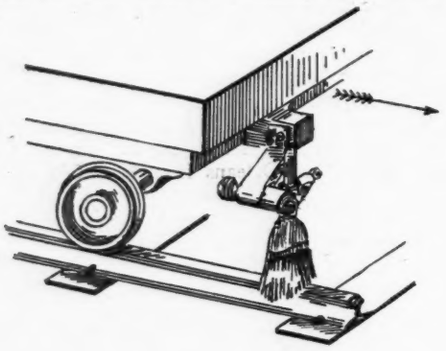
BY E. R. LEWIS,
Division Engineer, Michigan Central, Bay City, Mich.

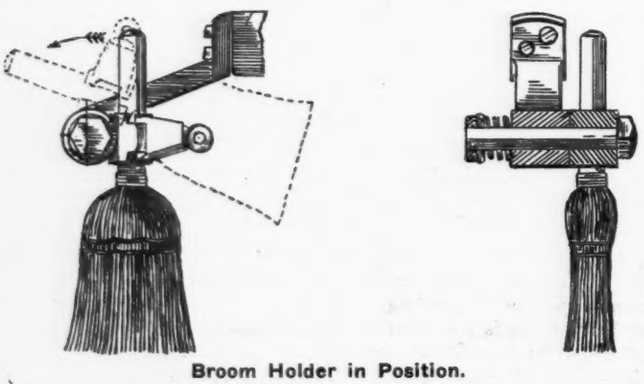
There are in use many kinds of holders for brooms, brushes or scrapers placed over the track rail, in front of the wheels of hand or motor car, to clear the running surface of obstacles



Broom Holder for Hand Car.

which might derail or impede the progress of the car. The widest use of such fixtures is the clearing of snow from the track rails. A hand car cannot make headway over a track when even a very little snow has fallen or is falling on the rails.





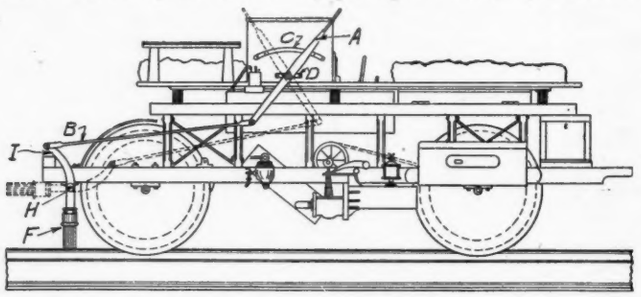
Broom Holder in Position.

Some such device as is here illustrated is therefore an absolute necessity to the use of hand cars in winter, where snow must be reckoned with. The usual fixture is a cast iron bracket with a set screw, wedge or peg to hold the broom handle in place. If the hand car has to be set off the track hurriedly these brooms and brackets are susceptible of displacement or breakage. The car brooms have to be shifted often in a day, and much time is lost in cutting and driving wedges, moving and readjusting the brooms to the exact necessary height.

The broom holder here illustrated may be put in the horizontal or imperative position by one pressure of the hand on the broom handle, and the car may be removed from the track from in front of an approaching train with almost no loss of time on account of the brooms. Also, the brooms are saved from dragging over the ground when the car is taken off the track on other than emergency occasions. This holder may be operated on motor cars by means of a level placed so as to be convenient to the operator's hand. It weighs about 5 lbs.

STEEL BRUSH PROTECTION FOR A MOTOR CAR.

A steel brush designed to sweep sticks, ballast and even torpedoes from the rail in advance of the wheels of a motor car, has been made by S. C. Tanner, master carpenter of the Baltimore & Ohio, and is illustrated herewith. The arrangement consists of two levers, A and I, pivoted at D and H, respectively, and connected by the rod B. By pulling the lever, A, backward



Steel Brush for Motor Car.

the brush is thrown from a horizontal position into place over the rail and sweeps the entire head of the rail clean of obstructions. When not in use it projects horizontally ahead of the car.

As a large proportion of the accidents to motor cars result from derailments caused by small obstructions on the track, a device such as this should be most useful.

DUMPING SCALE BOXES.

A contractor on a large job of rock excavation has found the use of scale boxes for handling material to be economical. The cut was comparatively short and very deep, the excavated material being wasted over the bank near one end of the cut. The scale boxes were loaded at the working face and were drawn down to a point opposite the waste bank on narrow gage flat cars. A stiff-leg derrick located on the top of the bank was used to pick up the boxes from the cars. The derrick hoisting line was attached to the box at four points by hooks located on the upper edge of the box near each corner. A separate dumping line was attached to a hook on the lower edge of the box near the center of one side and was carried over separate blocks on mast and boom to the operator's platform. To dump the box it was hoisted several feet above the level of the waste bank, the dumping line was snubbed around a block on the platform and the hoisting line was slacked. This allowed the dumping line to take the weight, which automatically tipped the box and dumped the material.

General News Section.

J. W. Cline, president of the International Association of Blacksmiths and Helpers, estimates that the strike last autumn on the Harriman Lines, exclusive of the Illinois Central, cost the men who struck about $9,000,000 in wages.

According to press reports, delegates representing the shop trades on all the railways west of Chicago will meet at Kansas City on March 4 for the purpose of organizing a federation to include all mechanical department employees.

The snow storm of February 9 and 10 was so severe in the region of Oswego, N. Y., that the New York Central had to use its two rotary snow plows to clear some parts of its lines. One passenger train was stalled ten miles east of Oswego for about 36 hours.

A second suit against the New York, New Haven & Hartford has been begun in the Federal court at Hartford, Conn., alleging violation of the hours-of-service law. The present suit and that begun in January together make demands for penalties aggregating $25,000.

There are now in service on the Pennsylvania Lines East 588 steel coaches, 58 steel dining cars, 99 steel passenger and baggage cars, 78 steel baggage cars, 94 steel postal cars and 710 steel Pullman cars. In addition, there are being built 251 steel coaches, 31 steel passenger and baggage cars and 194 steel Pullman cars.

A report issued by the Atchison, Topeka & Santa Fe, shows that in the six months ending January 31, 1912, during which the officers of the road have been conducting an active safety campaign, there were 36 employees killed and 3,608 injured, a decrease of ten killed and 447 injured, as compared with the corresponding period of the previous year.

Senator Gallinger, of New Hampshire, has introduced a bill in the United States Senate providing for protection of stockholders in corporations doing an interstate business. Among other things the bill would require a two-thirds vote of the directors to pass any measure and publicity of all minutes and records of both stockholders' and directors' meetings.

The Oriental Limited on the Great Northern from Seattle to Chicago on February 13 struck spreading rails near Doyon, 20 miles west of Devil's Lake, N. D., left the track and rolled into a ditch, fatally injuring two persons and seriously injuring a number of others. Every car with the locomotive left the track and turned over, piling up at the foot of the 20-ft. elevation of the tracks.

The Delaware, Lackawanna & Western has awarded its prizes to trackmen for the year 1911, first prizes aggregating $1,000, and second prizes $500. The section foreman on each division who shows the best alinement, surface and general conditions receives $100 in cash and a silver medal, and there is a second prize of $50 in cash and a silver medal. The winner of the first prize also has affixed to his toolhouse a sign reading "First Prize, 1911."

The Montauk Harbor Improvement Company has been incorporated at Brooklyn, N. Y., for the purpose of installing docks and shipping facilities at Fort Pond Bay, at the eastern end of Long Island. The principal promoter of the enterprise, so far as known, is W. E. C. Mayer, a lawyer. It is said that capitalists of Paris, Antwerp and other European cities are interested and that a large tract of land adjoining that owned by the Long Island Railroad Company at Fort Pond Bay has already been acquired. The Pennsylvania and the Long Island have discussed the establishment of a port at Fort Pond Bay for trans-Atlantic steamships, but no action has been taken.

The Brotherhood of Locomotive Engineers has submitted to Eastern roads a petition asking for increased pay and changes in the conditions of service. The railway managers will reply at a conference to be held at the end of the month. The petition was submitted to nearly every road in the East, and the most important feature of it is the effort to get uniform conditions of service. On Eastern roads these conditions now vary so much that, while the unit rates of pay are substantially the same, the actual wages received differ greatly. Differentials for heavy engines, double pay for overtime, switching and belt line increase to be based on the day, and a minimum day's pay for the completion of a run after being hung up under the 16-hour law (with additional pay for any further work done on that day) are among the points raised.

Department of Natural Resources.

This is the title of the new department which has been established by the Canadian Pacific to have charge of the land, irrigation, coal mining, and timber departments of the company's service. The headquarters will be at Calgary, and the department will be in charge of J. S. Dennis, recently appointed assistant to the president. The Canadian Pacific has large tracts of coal lands at Lethbridge, Bankhead and Hosmer, with mines already opened, and also large deposits of coal on Vancouver Island. Mr. Dennis reports that the "ready-made farm" policy of the company has become so popular that the number of desirable settlers is increasing.

Costly Refrigeration.

The San Antonio & Aransas Pass has been sued in the District Court at Austin, Tex., by the attorney general of the state for $35,000 penalties for failure to keep its passenger waiting room in Lincoln, Tex., heated for a period of 70 days this winter. Each day constituted a separate offense.

Frisco Line to New Orleans.

It is announced that the St. Louis & San Francisco has made a contract with the New Orleans & North Eastern for the use of the N. O. & N. E., from Laurel, Mississippi, to New Orleans, 146 miles, where a connection can be made with the New Orleans Terminal Company, which is owned jointly by the Frisco and the Southern. With an entrance into New Orleans from Laurel, the Frisco will be able to carry out its plan announced last summer (*Railway Age Gazette*, November 24, page 1073) to establish a through line from Chicago, St. Louis and Memphis to New Orleans, over the New Orleans, Mobile & Chicago. By this line the distance from St. Louis to New Orleans will be 744 miles (only 26 miles longer than the shortest line), and from Chicago to New Orleans, 1,015 miles. When the N. O. M. & C. shall have been extended northward to a connection with the Mobile & Ohio, the Frisco, it is claimed, will control a line shorter than any other to New Orleans from both Chicago and St. Louis.

Government Directors Proposed.

"As long as the public demand is for publicity and government regulation, how would you meet it?"

"By giving the government a representation in the directorate of all interstate companies commensurate with its interest. I realize what objection would be raised to this plan—that the Pacific Railway experiment in the same line had not proved a success. Well, if a government director fails to do his duty, does not the fault lie with him, rather than with the plan? Perhaps you will reason that a single director, however worthy personally, is quite overslaughed in a board comprised of several representatives of the stockholders. Then give him the right to call for assistance. Let the government put in as many directors as it needs to insure the company's doing what it ought, or being exposed if it doesn't. This power of exposure, at least, is one not to be lightly reckoned with. But no politicians are wanted for such places, or men who feel that they must shoot off skyrockets once in so often to convince the public that they are earning their salaries. Give the positions sufficient dignity, permanency, and compensation to attract competent business men with some knowledge of railroading.

"As to publicity, there is a distinct line to be drawn. Publicity in those matters which it is for the best interest of all concerned to have published is all right. But if you are going, let us say,

to build a spur of road from your main line to some point at a distance, and you advertise your projected route prematurely, every hamlet along some other potential route will rise and bombard the legislature with remonstrances, and you will have delays, and hold-ups, and all sorts of obstructions thrown in your way. That, surely, is not for the public interest, but it is what some of the critics of corporate rapacity would insist upon just as earnestly as on the publicity of your balance sheets."—*Charles S. Mellen; interview in The Outlook.*

What the Trainmen Want.

The legislative committee of the Brotherhood of Railroad Trainmen for the state of Indiana, 42 men, representing 42 lodges, held its regular meeting at Indianapolis last week and discussed the subjects on which legislation is to be sought. The law desired, as outlined by the chairman, Mr. Feick, are:

"To reduce to a reasonable standard the number of cars in any one train.

"To provide for a standard field examination upon the signals used.

"To hold the railway company liable for discriminating against men of experience seeking employment who are past the age of 35.

"To compel an engineer and conductor to have had at least two years' experience as a fireman or brakeman.

"To provide for an eight-hour work day for all men engaged in yard service.

"To prohibit, as far as practicable, the practice of double heading engines.

"To regulate the voluntary relief associations and a strong workman's compensation act.

"To provide for a semi-monthly pay day.

"To strengthen the block signal and safety appliance laws."

Mr. Feick added, "I believe that labor can secure many of the things for which they are contending through legislation. They have it in their power to make and unmake governors. senators and representatives."

Rumors of "Graft" in Puget Sound Extension.

Wide publicity has been given by the newspapers during the past week to indefinite rumors that an investigation by some stockholders of the Chicago, Milwaukee & St. Paul has indicated a large amount of "graft" in connection with the construction of and purchase of equipment for the Chicago, Milwaukee & Puget Sound. The papers have also asserted that suits were to be brought by these unnamed stockholders, but these have not yet materialized. The rumors were immediately and emphatically denied by officers of the St. Paul and the Puget Sound roads.

The rumors intimated that a relative of one of the St. Paul's officers had profited largely by contracts for equipment placed with supply concerns with which he was connected, and reference was made in the papers to the fact that Lawrence Fitch, a son-in-law of President Earling, and one of the trustees of the Puget Sound, is vice-president of the Beaver Dam Malleable Iron Company, which had large contracts for furnishing tie plates and castings to the road, and is also connected with several other railway supply concerns. Reference was also made to the fact that two brothers of President Earling—George P. Earling and Emil Earling—are officers of the Central Coal Company of Milwaukee, which sells coal to the St. Paul. They also referred to alleged connections of officers and employees of the St. Paul with the Western Land & Cattle Company, which operated in lands along the line of the Puget Sound.

President Earling, Vice-President E. W. McKenna, and other officers of the St. Paul asserted that all materials and supplies had been bought in the open market, and that they had been acquired at the lowest practicable prices. On Tuesday of this week President Earling gave out the following signed statement: "Certain sensational matter appeared in the press on Wednesday, the seventh instant, to the effect that an investigation by stockholders of the Chicago, Milwaukee & St. Paul Railway had disclosed grave irregularities in the construction and equipment of the Chicago, Milwaukee & Puget Sound Railway. These statements were promptly met with the following denial. 'The statement that the Chicago, Milwaukee & Puget Sound had been defrauded of the sum of a million dollars, or any other sum of money, in connection with the construction and equipment of that railway, is absolutely and unqualifiedly false.' Yesterday, the twelfth instant, a statement appeared in some of the newspapers to the effect that a conference had been held between alleged aggrieved persons and officers of the railway company, and that a compromise was reached, by which restitution was to be made. I desire to state that there has been no such conference, and any statement to the effect that there has been a compromise, or a necessity for a compromise, is entirely without foundation. I desire also to reaffirm that there has been no diversion or misuse of the funds of either corporation."

American Railway Engineering Association.

The thirteenth annual convention of the American Railway Engineering Association will be held at the Congress Hotel and Annex, Tuesday, Wednesday and Thursday, March 19-21, inclusive, at which time the annual election of officers will be held and the reports of twenty-one standing and special committees will be received. The annual dinner will be given in the Gold Room of the Congress Hotel and Annex at 7 p. m. the evening of March 20. At this banquet the speakers will be L. F. Loree, president Delaware & Hudson, and past president of the American Railway Association; Hon. F. D. Monk, K. C., M. P., Minister of Public Works of Canada, and Ray Morris, banker and formerly managing editor and now a director of the *Railway Age Gazette.*

International Safety Congress.

An International Safety Congress will be held in Milan, Italy, May 27-31. This congress, the first of its kind of international scope ever held, will be for the purpose of promoting a world wide movement for the conservation of human life in industry. The American Museum of Safety, New York, is making preparations to have the United States well represented. An American national committee has been selected by the museum to co-operate with the international body and to promote the American ideas and views at the congress. Dr. W. H. Tolman, director of the American Museum of Safety, and other members of the committee will attend the congress.

Among the papers which will be read at the congress are: The Safety Engineer on a Large Transportation System, by Dr. W. H. Tolman, and The Work of the Safety Committee of the United States Steel Corporation.

International Congress of Navigation.

The twelfth International Congress of Navigation will be held at the Metropolitan Opera House, Philadelphia, Pa., May 23-28. Bulletin No. 2 has been published, giving full information on the place and time of the congress, trans-Atlantic steamship offers, excursions arranged independent of official and local excursions, rates from the Isthmus of Panama, etc.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.; annual, May 7-10, Richmond, Va.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Boston, Mass.; annual, May 10-11, San Francisco, Cal.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—W. C. Hope, New York; next convention, Seattle, Wash.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, East St. Louis, Ill.; annual, June 18-21, Chicago.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—O. G. Fetter, Carew building, Cincinnati, Ohio; 3d Friday of March and September; annual, March 17, Chicago.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.

AMERICAN ELECTRIC RAILWAY MANUFACTURERS' ASSOC.—George Keegan, 165 Broadway, New York. Meetings with Am. Elec. Ry. Assoc.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago. Convention, 3d week in Oct., Baltimore, Md.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, Monadnock Block, Chicago; annual convention, March 19-21, 1912, Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOC.—J. W. Taylor, Old Colony building, Chicago. Convention, June 17-19, Atlantic City, N. J.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—M. H. Bray, N. Y., N. H. & H., New Haven, Conn.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—J. R. Wemlinger, 13 Park Row, New York; 2d Tuesday of each month, New York.
AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.
AMERICAN WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, B. & O., Baltimore, Md. Convention, 3d week in January, 1913, Chicago.
ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; annual, June 26, 1912, Quebec, Que.
ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago; annual convention, May 22, 1912, Los Angeles, Cal.
ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago.
ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 135 Adams St., Chicago; annual, June 24, 1912, New York.
ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conrad, 75 Church St., New York.
CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.
CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays, Montreal.
CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.
CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.
CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—L. S. Pomeroy, Old State Capitol building, St. Paul, Minn.; 2d Monday, except June, July, August and September, St. Paul.
ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.
ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.
FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Richmond, Va.; annual, May 15, Buffalo, N. Y.
GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—E. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.
INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.
INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago. Convention, May 22-25, Chicago.
INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—L. H. Bryan, Brown Marx building, Birmingham, Ala. Convention, July 23-26, Chicago.
INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio. Convention, August 15, Chicago.
MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York; annual convention, May 14-17, Pittsburgh, Pa.
MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Annual convention, June 12-14, Atlantic City, N. J.
MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOC. OF U. S. AND CANADA.—A. P. Dane, B. & M., Reading, Mass. Convention, 2d week in September.
NATIONAL RAILWAY APPLIANCES ASSOC.—Bruce V. Crandall, 537 So. Dearborn St., Chicago. Meetings with Am. Ry. Eng. Assoc.
NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.
NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.
NORTHERN RAILROAD CLUB.—C. L. Kennedy, C., M. & St. P., Duluth, Minn.; 4th Saturday, Duluth.
OMAHA RAILWAY CLUB.—H. H. Maulick, Barker Block, Omaha, Neb.; second Wednesday.
RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.
RAILWAY BUSINESS ASSOCIATION.—Frank W. Noxon, 2 Rector St., New York.
RAILWAY CLUB OF PITTSBURGH.—J. B. Anderson, Penna. R. R., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.
RAILWAY ELECTRICAL SUPPLY MANUFACTURERS' ASSOC.—J. Scribner, 1021 Monadnock Block, Chicago. Meetings with Assoc. Ry. Elec. Engrs.
RAILWAY GARDENING ASSOCIATION.—J. S. Butterfield, Lee's Summit, Mo.; next meeting, August 13-16, Roanoke, Va.
RAILWAY INDUSTRIAL ASSOCIATION.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.; annual, May 12, 1912, Kansas City, Mo.
RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa. Next meeting, March 18, Chicago.
RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio. Convention, May 20-22, Buffalo, N. Y.
RAILWAY SUPPLY MANUFACTURERS' ASSOC.—J. D. Conway, 2135 Oliver Bldg., Pittsburgh, Pa. Meetings with M. M. and M. C. B. assocs.
RAILWAY TEL. & TEL. APPLIANCE ASSOC.—W. E. Harkness, 284 Pearl St., New York. Meetings with Assoc. of Ry. Teleg. Sups.
RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.
ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—L. C. Ryan, C. & N. Y., Sterling; September, 1912, Buffalo, N. Y.
ST. LOUIS RAILWAY CLUB.—B. W. Fraumenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.
SIGNAL APPLIANCE ASSOCIATION.—F. W. Edmonds, 3868 Park Ave., New York. Meetings with annual convention Railway Signal Association.
SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Station, Chicago.
SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.
SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.
TOLEDO TRANSPORTATION CLUB.—J. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.
TRAFFIC CLUB OF CHICAGO.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.
TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.
TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Erie, Pittsburgh, Pa.; meetings monthly, Pittsburgh.
TRAIN DESPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 18, 1912, Louisville, Ky.
TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; first Saturday after first Wednesday.
TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.
TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.; August, 1912.
WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except, June, July and August, Winnipeg.
WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.
WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Monday in month except July and August, Chicago.

Traffic News.

The Panama road is now refusing large amounts of freight, the construction work on the canal in the region of Gatun Lake requiring that for a considerable distance the general traffic shall be moved over a single track, taxing the capacity of the line.

The traffic department of the Rock Island Lines has issued a circular letter to its station agents, asking them to investigate the seed corn situation in their respective territories. It is announced that the company proposes to buy seed corn in the localities where it is plentiful and distribute it in the sections where a scarcity is found.

The Baltimore & Ohio, at its shops in Baltimore, has fitted up a car for the use of the Maryland association for the prevention and relief of tuberculosis, and the car is to be used to carry lecturers and exhibits, illustrating that subject, over the lines of the road in Maryland and perhaps in other states. The car is enameled in white both inside and out.

Following the announcement from Washington that the Interstate Commerce Commission had suspended Western Classification No. 51 from February 15 to June 14, the Western Classification committee, which has been holding an executive session at Chicago to consider the arguments presented by shippers at the recent Galveston meeting on the proposed changes in the next issue of the classification, adjourned for the purpose of making a check of the changes effected by No. 51, which will be tabulated for presentation to the commission. One effect of the suspension will be to postpone the next meeting of the committee which had been called for July 16 at Mackinac Island.

Press reports of car shortage, and especially of delay in the movement of grain in the northwest, have been numerous in the past few days. The delay is especially pronounced in the movement of grain from the western Canadian provinces to Port Arthur, Ft. William and Duluth. George Bury, vice-president and general manager of the Canadian Pacific at Winnipeg, has given out a statement explaining that the delay has been due partly to the fact that the crop was late in maturing and that the coal strike in the west made necessary a heavy movement of cars westward, thereby interfering with the grain movement, but that the Canadian Pacific had at all times during the crop movement of the past season all the cars and locomotives its tracks would accommodate. The congestion, he said, was caused rather by lack of terminal room and of second tracks than by shortage of equipment, because the railways had been required to devote their attention to building new lines, and also because merchants and manufacturing companies have not been able to sufficiently increase their warehouse accommodations and their loading and unloading facilities, thereby throwing an additional strain on the railway terminals. He estimated that on February 6 sixty-one million bushels of wheat awaited shipment, and that it could all be handled by early summer. The complaints of car shortage have come largely from grain and lumber shippers in Minnesota, the Dakotas, Montana, northern Iowa and Wisconsin.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association in presenting statistical bulletin No. 111-B, giving a summary of car shortages and surpluses by groups from September 28, 1910, to January 31, 1912, says:

"The zero weather recently experienced has resulted in a further decrease in car surplus. The total surplus on January 31, 1912, was 55,592 cars, a decrease of 46,887 cars as compared with the previous report and 100,763 cars as compared with February 1, 1911. The decrease is principally in coal cars and most noticeable in the coal producing section of the country. Of the total decrease of 46,887 cars, 28,728 are coal cars, of which 25,046 are shown in groups 2 (New York, New Jersey, Delaware, Maryland, Eastern Pennsylvania) and 3 (Ohio, Indiana, Michigan, Western Pennsylvania). Box cars show a universal decrease in surplus of 10,330 cars, groups 9 (Texas, Louisiana, New Mexico) and 11 (Canadian Lines) being the only groups reporting an increase. Flat and miscellaneous cars also show decreases in surplus of 1,153 cars and 6,676 cars respectively.

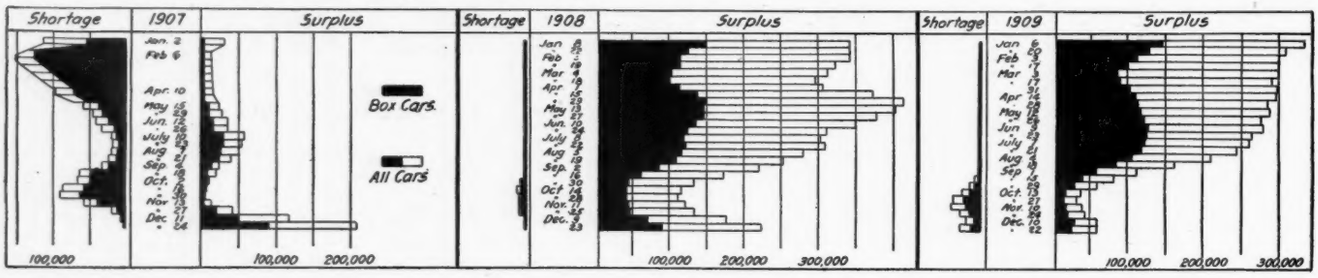
"There is a rather noticeable increase in the total car short-

age, the total shortage for the period covered by this report being 23,011 cars, an increase of 10,817 cars over the preceding period and the largest shortage reported since March 16, 1910. This is an indication of the difficulty of moving cars to fill orders in extremely cold weather. The shortage increase is shown to be in all classes of cars, but chiefly in box cars, which show an increase of 6,172 cars, and coal cars, which show an increase of 2,963 cars. Flat and miscellaneous cars show increases in

CAR SURPLUSES AND SHORTAGES.

Date.	No. of roads.	Surpluses: Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages: Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group *1.—January 31, 1912	7	0	2,001	1,323	147	3,481	1,404	0	0	237	1,641
" 2.— " 31, 1912	25	1,282	129	2,075	746	4,232	40	0	2,214	105	2,359
" 3.— " 31, 1912	25	775	1,236	2,136	2,002	6,149	2,498	25	550	747	3,820
" 4.— " 31, 1912	11	440	423	388	646	1,897	892	0	1,895	0	2,787
" 5.— " 31, 1912	19	1,084	221	2,262	1,110	4,677	506	66	322	115	1,009
" 6.— " 31, 1912	23	796	623	1,910	3,228	6,557	4,360	259	250	121	4,990
" 7.— " 31, 1912	3	0	159	20	358	537	513	0	61	2	576
" 8.— " 31, 1912	15	167	192	900	1,320	2,579	889	56	231	0	1,176
" 9.— " 31, 1912	11	3,655	89	541	915	5,200	50	32	15	12	109
" 10.— " 31, 1912	18	4,261	2,623	2,481	9,312	18,677	160	0	0	18	178
" 11.— " 31, 1912	5	321	419	6	860	1,606	3,730	100	0	536	4,366
Total	162	12,781	8,125	14,042	20,644	55,592	15,042	538	5,538	1,893	23,011

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland, and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin, Minnesota and the Dakotas lines; Group 7—Montana, Wyoming and Nebraska lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Oregon, Idaho, California and Arizona lines; Group 11—Canadian lines.



Car Surpluses and Shortages in 1907 to 1912.

shortage of 353 and 1,329 cars respectively. The severity of the weather has doubtless contributed to this showing."

The accompanying table gives car surplus and shortage figures by groups for the last period covered in the report, and the diagrams show total bi-weekly surpluses and shortages in 1907 to 1911.

INTERSTATE COMMERCE COMMISSION.

The commission, on Friday last, ordered a general investigation of the practice of all interstate carriers with respect to the issuance of passes. The commission hears that many carriers are violating the law.

The proposed new freight classification presented by the western railways and which was the subject of protracted hearings at Chicago, as reported in the *Railway Age Gazette* last week, has been suspended until June 14.

The commission has suspended until August 28 the proposed new freight tariffs presented by the transcontinental roads several months ago. These were first suspended until the 28th of this month and the further suspension now ordered has been made necessary by the improbability of finishing the inquiry.

Tariffs naming rates for icing refrigerator cars, which were filed by numerous railways several months ago and which were suspended until February 10, have been further suspended until June 1. Hearings will be held on this question at Washington within the next month.

STATE COMMISSIONS.

The End of One Experiment.

The New York Public Service Commission, Second district, has made an order allowing the Delaware & Hudson to discontinue the operation of two trains previously ordered run on its Saratoga division to accommodate traffic from Gansevoort. It was shown that public necessity did not require the continuance of these trains. The road provides for the afternoon traffic by stopping train No. 40 southbound at Gansevoort at 5:10 p. m.

COURT NEWS.

The supreme court of Ohio has reversed the circuit court of Franklin county, and has held that the circuit court has jurisdiction to hear the suit brought by the state to oust the Chesapeake & Ohio from Ohio, on the charge that it is a member of a trust and is operating against the law. The circuit court has held that it did not have jurisdiction, because the Chesapeake & Ohio was a foreign corporation.

The Supreme court of Missouri has dismissed the proceedings instituted by Attorney-General Major in 1909 against 16 railways, asking the forfeiture of their charters on account of alleged violations of the state anti-trust law in fixing rates. The court held that the Missouri statutes recognize the right of railways to enter into many kinds of agreements with reference to the transportation of freight and passenger without violating the laws.

The commerce court at Washington on Tuesday last heard the application of the Florida East Coast for an order to restrain the Interstate Commerce Commission from reducing freight rates on fruits and vegetables to Jacksonville and other basing points in Florida, and granted a temporary injunction, pending a final hearing. The road was required to give a bond of $100,000 to repay shippers in case the lower rates should finally be sustained.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF DECEMBER, 1911. (SEE ALSO LAST WEEK'S ISSUE.)

Name of road.	Mileage operated at end of period.	Operating revenues: Freight.	Passenger.	Total, inc. misc.	Operating expenses: Maintenance: Way and structures.	Of equipment.	Traffic.	Transportation.	General.	Total.	Net operating revenue (or deficit).	Outside operations, net.	Taxes.	Operating income (or loss).	Increase (or decr.) comp. with last year.
Alabama Great Southern	309	$293,321	$112,042	$443,532	$47,933	$93,063	$11,192	$133,381	$10,273	$295,842	$147,690	—$782	$15,048	$131,860	$12,747
Arizona Eastern	366	121,080	34,882	164,550	27,249	13,075	2,050	45,290	5,964	93,628	70,922	227	13,789	57,360	10,897
Atlantic City	166	59,165	45,720	110,875	36,832	13,352	1,173	64,773	670	116,800	—5,925	—4,580	7,000	—17,505	3,555
Canadian Pacific Lines in Maine	233	103,853	40,356	151,879	14,315	14,469	5,223	70,952	6,625	111,584	40,295	.....	7,000	33,295	11,883
Carolina, Clinchfield & Ohio	238	155,473	12,516	171,151	9,800	19,915	5,070	34,898	8,032	77,715	93,436	.....	8,000	85,436	31,378
Carolina, Clinchfield & Ohio of S. C.	17	8,784	2,023	11,087	591	113	983	2,672	416	4,775	6,312	.....	500	5,812	1,170
Chicago, Rock Island & Gulf	476	245,540	55,214	317,220	11,261	20,471	10,270	92,579	8,863	143,444	173,776	—167	2,523	171,086	73,055
Chicago, Terre Haute & Southeastern	351	138,532	19,337	161,868	20,392	23,259	2,657	52,235	8,321	106,864	55,004	—353	8,700	45,951	.....
Cincinnati Northern	245	94,770	17,976	117,569	20,188	19,744	2,642	51,674	3,189	97,437	20,132	.....	7,591	12,541	—1,345
Cleveland, Cincinnati, Chicago & St. L.	2,010	1,736,817	654,140	2,622,721	261,369	426,319	67,923	1,067,945	65,865	1,889,421	733,300	—1,302	92,512	639,486	88,777
Duluth, South Shore & Atlantic	622	148,835	73,734	234,829	29,773	30,505	9,896	93,337	8,683	172,194	62,635	—85	15,666	46,884	—12,574
Georgia	307	196,134	91,797	307,853	23,182	44,562	9,826	118,592	7,492	203,654	104,199	.....	1,753	102,446	8,083
Georgia Southern & Florida	395	112,402	82,694	234,652	20,775	46,075	7,678	82,251	9,486	166,265	68,387	.....	12,532	55,855	3,225
Hocking Valley	352	430,097	74,121	547,718	57,613	90,122	9,355	177,430	17,850	352,370	195,348	.....	30,400	164,948	57,355
Houston, East & West Texas	190	72,765	32,700	110,172	16,280	12,093	1,812	41,015	4,512	75,712	34,460	.....	6,848	27,612	—15,846
Houston & Texas Central	789	333,061	170,011	541,530	71,251	111,053	16,614	227,946	22,129	448,993	92,537	—1,338	29,102	62,097	—118,749
Kanawha & Michigan	175	214,839	30,385	250,822	22,634	48,733	2,062	80,779	6,941	161,149	89,673	—10	8,808	80,855	2,406
Lake Erie & Western	886	357,553	72,728	457,163	64,163	76,617	12,964	184,121	11,266	349,131	108,032	.....	19,886	88,146	—2,307
Louisiana & Arkansas	255	91,274	20,783	116,889	15,550	18,684	2,298	34,676	4,539	75,747	41,142	.....	3,650	37,492	—8,349
Louisiana Ry. & Navigation	350	119,618	26,259	157,774	21,945	13,650	6,303	67,555	7,542	116,995	40,779	.....	4,900	35,879	3,729
Morgan's La. & Tex. R. R. & S. S. Co.	404	433,437	116,645	584,011	47,582	63,917	14,246	221,231	11,804	358,780	225,231	2,654	18,652	209,233	—82,063
Nevada Northern	165	93,813	11,408	107,984	11,787	14,084	517	26,991	3,648	57,027	50,957	.....	4,755	46,202	—28,960
New Orleans Great Northern	282	88,319	32,389	131,544	19,974	16,998	2,002	45,035	7,963	91,972	39,572	—63	2,250	37,259	—3,151
New York, Susquehanna & Western	152	176,628	54,173	259,960	19,343	22,371	2,096	100,210	4,515	148,535	111,425	—11,195	17,874	82,356	—14,668
Pecos & Northern Texas	478	130,700	42,384	180,086	30,625	35,188	3,019	68,853	5,095	142,780	37,306	.....	+253	37,559	—11,385
Port Reading	21	117,151	.....	118,314	13,108	10	30	30,288	106	43,542	74,772	7,313	3,800	78,285	—18,161
St. Louis, Brownsville & Mexico	509	113,128	63,680	190,398	41,503	12,781	2,907	74,550	7,625	139,366	51,032	.....	11,134	39,898	14,828
St. Louis Southwestern of Texas	703	316,537	102,448	444,868	56,584	74,101	13,819	174,620	18,298	337,422	107,446	—195	12,717	94,534	60,426
San Pedro, Los Angeles & Salt Lakes	1,115	409,500	224,230	694,351	75,664	172,161	36,731	287,058	15,684	587,298	107,053	—3,001	24,710	79,342	—111,377
Southern Kansas of Texas	124	82,453	16,913	105,421	11,228	22,734	2,622	44,237	4,488	85,309	20,112	.....	2,745	17,367	—14,236
Texas & Pacific	1,884	1,291,262	426,500	1,807,910	148,712	174,584	30,870	744,171	56,460	1,154,797	653,113	—11,341	137,213	504,559	—56,423
Trinity & Brazos Valley	462	242,282	38,632	289,288	54,992	38,711	9,659	137,735	12,700	253,797	35,491	.....	4,334	31,157	—29,910
Ulster & Delaware	128	43,552	17,474	65,080	9,327	11,430	942	31,935	2,811	56,445	8,635	182	3,300	5,517	6,470
Western Pacific	934	307,369	81,048	402,154	80,844	37,092	25,561	202,292	25,079	370,868	31,286	—3,479	14,550	13,257	.....
Wheeling & Lake Erie	457	451,662	51,554	538,234	57,040	107,162	6,704	198,411	13,947	383,264	154,970	1,606	28,586	127,990	26,587
SIX MONTHS OF FISCAL YEAR. 1912.															
Alabama Great Southern	309	$1,579,205	$628,442	$2,411,399	$258,149	$533,443	$64,697	$725,915	$56,875	$1,639,079	$772,320	—$2,158	$89,689	$680,473	$55,545
Arizona Eastern	366[1]	692,286	196,010	944,012	148,287	72,327	13,558	253,993	38,121	526,286	417,726	998	62,308	356,416	63,560
Atlantic City	166	408,789	784,909	1,254,543	162,677	79,044	16,655	558,936	7,992	825,304	429,239	—25,999	42,000	361,240	28,713
Canadian Pacific Lines in Maine	233	340,870	143,140	521,044	138,014	84,213	31,020	232,836	24,096	510,179	10,865	.....	42,000	—31,135	30,154
Carolina, Clinchfield & Ohio	238[2]	943,329	83,417	1,053,198	68,246	129,610	31,010	209,296	46,581	484,743	568,455	1,138	46,000	523,593	213,908
Carolina, Clinchfield & Ohio of S. C.	17	52,687	9,582	63,887	3,323	519	5,658	15,545	2,669	27,714	36,173	.....	3,000	33,173	14,538
Chicago, Rock Island & Gulf	476[3]	1,097,267	333,992	1,532,313	163,747	105,506	59,438	486,860	48,565	841,116	668,197	—1,357	35,951	630,889	111,198
Chicago, Terre Haute & Southeastern	351	824,184	112,017	958,206	144,252	150,441	16,407	283,652	44,489	639,241	318,965	—677	52,200	266,088	.....
Cincinnati Northern	245	548,001	125,356	707,993	131,008	131,344	16,685	266,958	17,358	563,353	144,640	.....	35,091	109,549	—20,499
Cleveland, Cincinnati, Chicago & St. L.	2,010[4]	10,421,626	4,240,577	16,006,029	1,701,912	2,451,003	470,504	6,000,243	331,856	10,955,518	5,050,511	—9,883	582,512	4,458,116	1,290,987
Duluth, South Shore & Atlantic	622[5]	1,034,677	539,214	1,658,966	256,559	167,763	61,342	605,668	52,793	1,144,125	514,841	9,473	105,666	418,648	—85,428
Georgia	307	1,175,876	495,174	1,776,122	145,566	248,790	65,490	719,373	47,542	1,226,761	549,361	.....	12,253	537,108	113,598
Georgia Southern & Florida	395	634,283	435,924	1,246,168	122,653	234,769	41,826	467,683	56,687	923,618	322,550	.....	62,693	259,857	7,977
Hocking Valley	352[6]	3,146,811	492,169	3,886,203	500,298	603,341	50,339	1,131,305	96,245	2,381,528	1,504,675	.....	242,359	1,262,316	182,991
Houston, East & West Texas	190	455,148	181,431	672,190	117,433	67,429	11,061	212,456	22,238	430,617	241,573	.....	26,806	214,767	—26,845
Houston & Texas Central	789	2,145,659	1,022,742	3,389,303	427,466	521,109	112,471	1,257,258	124,406	2,442,710	946,593	—7,477	139,693	799,423	—282,433
Kanawha & Michigan	175	1,510,931	187,582	1,730,857	203,314	277,499	13,360	505,703	39,765	1,039,641	691,216	28	54,075	637,169	—117,113
Lake Erie & Western	886	2,219,843	512,775	2,896,654	403,910	482,455	77,890	1,085,736	65,413	2,115,404	781,250	.....	119,296	661,954	110,280
Louisiana & Arkansas	255	538,886	113,419	681,119	125,995	106,569	14,048	187,651	28,436	462,699	218,420	.....	20,000	198,420	—55,634
Louisiana Ry. & Navigation	350	771,972	147.858	992,255	124,054	89,361	35,749	366,282	39,385	654,831	337,424	.....	28,200	309,224	144,964
Morgan's La. & Tex. R. R. & S. S. Co.	404[7]	1,811,121	626,921	2,580,886	300,183	345,863	80,969	1,012,489	74,347	1,813,851	767,035	—10,889	112,141	644,005	—247,646
Nevada Northern	165	613,590	65,223	696,156	77,057	87,904	2,392	148,304	20,455	336,112	360,044	.....	28,166	331,878	—65,718
New Orleans Great Northern	282	596,343	183,960	839,232	127,039	107,999	15,617	265,565	43,272	559,492	280,240	—496	12,250	267,494	—34,853
New York, Susquehanna & Western	152	1,058,043	319,089	1,542,231	161,236	135,326	11,912	565,788	30,906	905,168	637,063	10,460	107,241	540,282	32,900
Pecos & Northern Texas	478[8]	714,501	191,985	947,264	142,784	183,774	14,332	301,159	28,827	670,876	276,388	.....	22,795	253,593	—29,226
Port Reading	21	593,321	.....	602,788	53,662	898	186	166,799	735	222,280	380,508	16,055	22,800	373,763	—76,651
St. Louis, Brownsville & Mexico	509[9]	712,676	351,180	1,151,011	243,970	73,510	17,700	358,665	47,851	771,696	379,315	.....	33,634	345,681	206,122
St. Louis Southwestern of Texas	703	1,645,031	586,050	2,381,737	295,397	473,833	73,380	867,690	103,561	1,813,861	567,876	—1,111	62,716	504,049	282,058
San Pedro, Los Angeles & Salt Lakes	1,115[10]	2,574,609	1,513,984	4,382,428	785,229	947,610	193,967	1,699,280	102,706	3,728,792	653,636	—22,900	148,761	481,975	—354,962
Southern Kansas of Texas	124	555,686	95,731	679,041	115,504	137,013	12,860	243,136	25,454	533,967	145,074	.....	15,757	129,317	—92,868
Texas & Pacific	1,884	6,368,298	2,267,512	9,205,674	911,077	1,163,298	174,346	3,591,525	265,075	6,105,321	3,100,353	—23,407	418,901	2,658,045	353,150
Trinity & Brazos Valley	462	1,125,633	235,833	1,405,147	211,713	172,493	58,678	609,424	68,485	1,120,793	284,354	.....	28,839	255,515	120,637
Ulster & Delaware	128	355,880	248,273	633,203	84,665	63,757	9,006	242,533	14,991	414,952	218,251	507	19,800	198,958	—10,417
Western Pacific	934	2,250,347	605,247	2,934,172	528,050	251,660	162,589	1,137,235	134,262	2,213,796	720,376	—19,232	86,500	614,644	.....
Wheeling & Lake Erie	457	3,399,691	341,099	3,996,774	482,495	685,025	44,868	1,256,814	84,429	2,553,631	1,443,143	14,025	173,291	1,283,877	254,206

Operated in the previous year—[1] 354; [2] 236; [3] 470; [4] 1,982; [5] 608; [6] 350; [7] 348; [8] 296; [9] 501; [10] 1,105. — Indicates Deficits, Losses and Decreases.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Stuart H. McIntosh, assistant general auditor of the Boston & Maine, has been appointed general auditor, with office at Boston, Mass.

J. A. Caviezel, general auditor of the Jonesboro, Lake City & Eastern at Jonesboro, Ark., has been appointed general auditor of the Alabama, Tennessee & Northern, with office at Mobile, Ala.

J. S. MacKie, secretary and treasurer of the Chesapeake & Ohio, the Toledo, St. Louis & Western, and the Hocking Valley, and secretary of the Chicago & Alton, has been elected vice-president of the Toledo, St. Louis & Western.

L. C. Gaty, assistant to the general manager of the Jonesboro, Lake City & Eastern at Jonesboro, Ark., has been appointed general auditor, with office at Jonesboro, succeeding J. A. Caviezel, resigned to accept service with another company.

Amos Caryl Ridgway, whose election as second vice-president of the Rock Island Lines, with office at Chicago, has been announced in these columns, was born April 16, 1860, at Delaware Water Gap, Pa., and began railway work in 1877 as roadmaster's clerk on the Kansas Pacific, now part of the Union Pacific. He was then consecutively freight brakeman, switchman and conductor on the Union Pacific; chief clerk to the engineer of the Missouri, Kansas & Texas; and general roadmaster's clerk and work conductor on the Denver & Rio Grande. For seven years from 1882 he was chief clerk on the Second and Third divisions of the latter road, and was then made assistant superintendent of the same divisions. He was with the Florence & Cripple Creek and associated companies from May, 1896, to December, 1899, first as superintendent and later as general superintendent, and he was then for three years general manager of the Colorado Springs & Cripple Creek District, becoming general manager of the Denver, Northwestern & Pacific in September, 1902. He was general manager of the Denver & Rio Grande from March, 1905, until 1909, and went to the Chicago, Rock Island & Pacific in January, 1910, as assistant to the second vice-president. From April, 1910, to February 1, 1911, he was assistant general manager, and from the latter date until his recent election as second vice-president, he was again assistant to the second vice-president.

A. C. Ridgway.

H. F. Whitcomb, president of the Wisconsin & Northern at Milwaukee, Wis., has been elected president of the Eastern Wisconsin Railway & Light Company, with office at Milwaukee, succeeding Clement C. Smith. Mr. Whitcomb was formerly president of the Wisconsin Central.

A. D. Lightner, general agent in the executive department of the St. Louis & San Francisco, and general manager of the Birmingham Belt Railroad at Birmingham, Ala., has been appointed general agent of the executive department of the St. Louis & San Francisco Lines, with office at New Orleans, La.

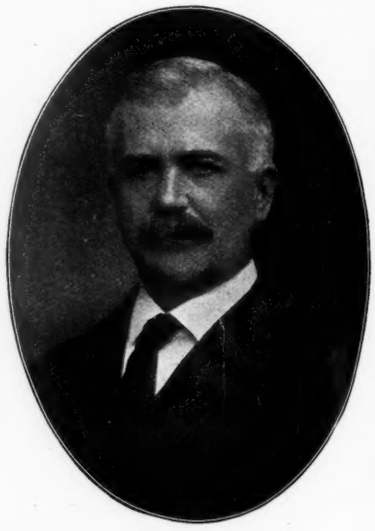
The officers of the Raleigh, Charlotte & Southern, a new line in North Carolina, are as follows: E. T. Lamb, president; E. C. Duncan, first vice-president; Frederick Hoff, second vice-president; Mathias Manly, treasurer; Morris S. Hawkins, secretary; N. M. Runnion, assistant secretary; W. L. Bird, auditor; J. H. Barrett, general claim agent; Chadbourne & Shores, general counsel, and W. B. Rodman, general solicitor. All of these officers hold similar positions on the Norfolk Southern, except E. C. Duncan. In addition to his duties as secretary, Mr. Hawkins will perform the duties of assistant to the president.

Edward L. Brown, whose election as vice-president and general manager of the Denver & Rio Grande, with office at Denver, Colo., has been announced in these columns, was born in Iowa on January 3, 1864, and began railway work in 1875, as a messenger on the Chicago, Rock Island & Pacific, with which road he was continuously until 1890. He was consecutively from 1877 telegraph operator, station agent and train despatcher, and for five years from 1883 was joint agent of the Rock Island, the Wabash and the Iowa Central. He went with the St. Paul & Duluth, now part of the Northern Pacific, as general agent at West Superior, Wis., in August, 1890, and was for eight months from April, 1891, commercial agent at St. Paul and Minneapolis. He was then transferred to the operating department, where he was consecutively chief despatcher and superintendent of telegraph, master of transportation and superintendent. In June, 1900, he was made superintendent of the Lake Superior division of the Northern Pacific at Duluth, and he was promoted to general superintendent of the Montana Central in February, 1902. In April, 1903, he went with the Great Northern as assistant general superintendent of the Eastern district at St. Paul; he was promoted to general superintendent of that district in March, 1907, and in October of the same year was transferred to the Western district as general superintendent, with headquarters at Spokane, which office he has just resigned to become vice-president and general manager of the Denver & Rio Grande.

Operating Officers.

The office of R. H. Howard, general manager of the New Orleans Great Northern, has been transferred from Bogalusa, La., to Jackson, Miss., and J. L. Gould has been appointed trainmaster, with office at Bogalusa, succeeding W. G. Mason, assigned to other duties.

Winfield S. Cooper, whose appointment as general superintendent of the Southern district of the Chicago, Milwaukee & St. Paul, with office at Chicago, has been announced in these columns, was born February 15, 1862, at Polk, Ohio. He attended the public schools at Ashland, Ohio, until May, 1877, when he began railway work as a telegraph operator on the Atlantic & Great Western, now the Erie. Subsequently he was consecutively operator and train despatcher on the Louisville & Nashville; train despatcher on the New York, Pennsylvania & Ohio, now the Erie; train despatcher on the Canadian Pacific, and from 1886 to 1895, he was train despatcher and chief despatcher on the Chicago, Milwaukee & St. Paul. In the latter year he was made trainmaster, and held that position until 1903, when he was promoted to superintendent. From 1906 until February 1, 1912, the date of his recent promotion, he was assistant general superintendent, with office at Chicago.



W. S. Cooper.

W. R. Hudson, general superintendent, C. P. Dugan, superintendent of transportation, and W. W. Morrison, chief special agent, of the Norfolk Southern, have been appointed to similar positions on the Raleigh, Charlotte & Southern, a new line in North Carolina, all with offices at Norfolk, Va.

C. O. Yoakum, assistant superintendent of the St. Louis & San Francisco at Springfield, Mo., has been appointed super-

intendent of the New Orleans, Texas & Mexico, with office at DeQuincy, La. C. T. Mason, assistant superintendent at Francis, Okla., succeeds Mr. Yoakum; and H. F. King, yardmaster at Sapulpa, Okla., succeeds Mr. Mason.

L. C. Gaty, assistant general manager of the Jonesboro, Lake City & Eastern at Jonesboro, Ark., having been appointed general auditor, the office of assistant general manager has been abolished; and C. C. Humber, chief despatcher and chief clerk to the superintendent, has been appointed chief clerk to the general manager. G. G. Fox succeeds Mr. Humber.

Andrew Ross, whose appointment as superintendent of the New Jersey & Lehigh division of the Lehigh Valley, with office at Easton, Pa., has been announced in these columns, was born on May 6, 1868, at Mauch Chunk, Pa., and was educated at the public schools. He began railway work in 1882 as a messenger on the Lehigh Valley. The following year he was made telegraph operator, and two years later he was promoted to train despatcher. In 1887 he was appointed yard master, and ten years later was made trainmaster, on the same road. Mr. Ross was appointed general yard master of the New York, New Haven & Hartford, at New Haven, Conn., in 1905, and the following year was promoted to assistant superintendent of the New York division. He was appointed superintendent of the Old Colony division of the same road in 1908, which position he held at the time of his recent appointment as superintendent of the New Jersey & Lehigh division of the Lehigh Valley.

Herman B. Earling, whose appointment as assistant general manager of the Chicago, Milwaukee & St. Paul, with office at Chicago, has been announced in these columns, was born October 30, 1862. He was educated in the public schools at Milwaukee, Wis., and began railway work in 1878 with the Chicago, Milwaukee & St. Paul, with which road and the Chicago, Milwaukee & Puget Sound he has been connected ever since. Until 1883 he was agent and operator; was then for five years assistant train despatcher; from 1887 to 1893, chief train despatcher; from 1893 to 1897, trainmaster, and then for a year superintendent of terminals. He was appointed division superintendent at Marion, Iowa, in 1898, and five years later became assistant general superintendent of the Middle district at Milwaukee. In 1906 he was transferred with the same title to the Northern district at Minneapolis, and later in that year was made general superintendent of the Puget Sound extension, in charge of construction between Mobridge, S. D., and Butte, Mont. On the opening of the Chicago, Milwaukee & Puget Sound, he was appointed general superintendent of that road in January, 1909, and in October of the same year was appointed general superintendent of the Chicago, Milwaukee & St. Paul, with office at Chicago, from which position he has just been promoted.

H. B. Earling.

Traffic Officers.

S. Van Auken, Jr., has been appointed commercial agent of the Seaboard Air Line, with office at Rochester, N. Y.

W. E. Gauvin, traveling freight agent of the Georgia Railroad at St. Louis, Mo., has been appointed commercial agent, with headquarters at St. Louis.

Erwin G. Koeneman has been appointed contracting freight agent of the Union Pacific, with office at St. Louis, Mo., succeeding Frank P. Mahoney, resigned.

W. E. Swain has been appointed general agent of the Northern Pacific, with office at Los Angeles, Cal., succeeding George W. McCaskey, deceased.

F. C. Herr, general agent of the New Orleans Great Northern, with office at Bogalusa, La., has resigned to go to another company, and his former position has been abolished.

James Gray, traveling passenger agent of the Boston & Albany, at Boston, Mass., has been appointed district passenger agent, with office at Springfield, succeeding G. S. Harner, resigned, and E. W. Goodwin succeeds Mr. Gray.

W. G. Trapp, traveling freight agent of the Tennessee Central at Chicago, has been appointed traveling freight agent of the Chicago, Indianapolis & Louisville, with office at Grand Rapids, Mich., succeeding Norman F. Crawford, resigned.

S. L. Rogers, general agent of the St. Louis & San Francisco at Nashville, Tenn., has been appointed district passenger agent at that place; and T. H. Glascock, traveling passenger agent at Nashville, has been transferred to Knoxville, Tenn.

B. L. Bugg, traffic manager, and W. W. Croxton, general passenger agent of the Norfolk Southern, both with offices at Norfolk, Va., have been appointed to similar positions on the Raleigh, Charlotte & Southern, a new line in North Carolina.

J. P. Fresenius, traveling freight agent of the St. Louis & San Francisco at New Orleans, La., has been appointed soliciting freight agent of the International & Great Northern, with office at Galveston, Tex., succeeding F. S. Sleight, resigned to accept service with another company.

J. W. Thomas, traveling freight agent of the Southern Railway at Chicago, has been appointed commercial agent, with office at Detroit, Mich. J. T. Mudd, also traveling freight agent at Chicago, has been appointed commercial agent, with office at Minneapolis, Minn. L. H. Mann, freight soliciting agent at Chicago, succeeds Mr. Mudd, and H. S. Knapp succeeds Mr. Mann. E. B. Ditto has been appointed a traveling freight agent, with headquarters at Lexington, Ky.

D. L. Ray, traveling freight agent of the Texas & Pacific at Fort Worth, Tex., has been appointed commercial agent, with office at Paris Tex., succeeding Charles H. Webb, resigned to accept service with another company, and A. B. Waldron succeeds Mr. Ray. A. L. Sarrels has been appointed commercial agent, with headquarters at Fort Worth, Tex., succeeding J. D. Healy, promoted to other duties. J. D. Webb, traveling freight agent at Dallas, Tex., has been appointed traveling freight agent in charge of New Orleans territory, with office at Alexandria, La., and W. R. Daniels succeeds Mr. Webb at Dallas.

W. A. Shropshire, formerly traveling freight agent of the Cleveland, Cincinnati, Chicago & St. Louis at Birmingham, Ala., has been appointed commercial agent of the New York Central Lines, with office at Jacksonville, Fla., succeeding E. L. Porter, transferred. C. B. Oakley has been appointed traveling freight agent at Richmond, Va., succeeding W. L. Dewey, promoted. J. H. Pepper has been appointed traveling freight agent, with office at Winston-Salem, N. C., and E. J. Dozier has been appointed a traveling freight agent, with office at Tampa, Fla. T. M. Devereaux, soliciting freight agent of the Cleveland, Cincinnati, Chicago & St. Louis at Cincinnati, Ohio, has been appointed dairy agent of the Merchants' Despatch Dairy Line, with office at Cincinnati. E. M. Snell, traveling freight agent at Cincinnati, succeeds Mr. Devereaux, and H. J. Gribling, also a soliciting freight agent, succeeds Mr. Snell.

Engineering and Rolling Stock Officers.

Fred M. Graham, division engineer of maintenance of way of the Pennsylvania lines at Fort Wayne, Ind., has been transferred to Chicago in a similar capacity, succeeding J. W. Barrie, resigned.

Guy Scott, division engineer of the Central system of the Pennsylvania Lines West at Toledo, Ohio, has been appointed division engineer on the Northwest system, with office at Fort Wayne, Ind., succeeding F. M. Graham, transferred.

H. F. Wardell, superintendent of power and equipment of the Chicago & Western Indiana and the Belt Railway of Chicago, with office at Chicago, has resigned to become assistant manager of the Central Locomotive & Car Works.

Henry Steele has been appointed roadmaster of the Bellingham Bay & British Columbia, with office at Bellingham, Wash., succeeding Charles Gilroy, assigned to other duties, and A. K.

Henderson, master carpenter at Bellingham, has resigned, and his former position has been abolished.

F. L. Nicholson, chief engineer, and D. W. Lum, consulting engineer, both with offices at Norfolk, Va., and J. E. Gould, superintendent of motive power, with office at Berkeley, Va., of the Norfolk Southern, have been appointed to similar positions on the Raleigh, Charlotte & Southern, a new line in North Carolina.

Purchasing Officers.

Ralph P. Moore has been appointed purchasing agent of the Duluth & Iron Range, with office at Duluth, Minn., succeeding Fred H. White, resigned to accept service with another company.

H. W. Davies, purchasing agent of the Norfolk & Southern, with office at Norfolk, Va., has been appointed purchasing agent also of the Raleigh, Charlotte & Southern, a new line in North Carolina.

Fred H. White, purchasing agent of the Duluth & Iron Range at Duluth, Minn., has been appointed purchasing agent of the Duluth, Missabe & Northern, with headquarters at Duluth, succeeding Sanford F. McLeod, resigned to engage in other business.

OBITUARY.

Robert B. Ways, foreign freight agent of the Baltimore & Ohio, at Baltimore, Md., died in that city on February 7, at the age of 48.

Albert H. Lander, for a number of years master of transportation of the Wabash and the Grand Trunk, and recently with the Missouri Pacific, died at his home at Sedalia, Mo., on January 20, 1912.

James R. Dunbar, general freight and passenger agent of the New York, Ontario & Western, at New York, died at his home at Valley Cottage, Rockland county, New York, on February 12, at the age of 51. Mr. Dunbar entered the service of the New York, Ontario & Western as general eastern agent, in 1890. He had been general freight and passenger agent since 1908.

FOREIGN RAILWAY NOTES.

The Argentine government has authorized the French Railway Co. of the province of Santa Fe to construct and operate a railway from some suitable point on the La Sabana to Barranqueras line of the same company, at or near the place called Presidente Roca, terminating on the Pilcomayo river, opposite Asuncion, Paraguay. The gage is to be 3 ft. 1 in., and plans and estimates must be submitted within eight months, and work commenced within six months thereafter.

The Chilean congress has before it a project which provides for a chain of railways connecting Cannavieras, in the state of Bahia, with Las Paz, Bolivia. It is planned that the railway should start at Cannavieras and run westward, crossing the north of Minas Geraes, the south of Goyaz and Matto Grosso, and end at La Paz, after crossing the frontier of Bolivia. The extent of the line is estimated as follows: 160 miles in the state of Bahia, 420 miles in the state of Minas Geraes, 310 miles for the state of Goyaz, and 465 miles for the state of Matto Grosso, making a total length of 1,345 miles.

A commission has been chosen to consider the organization of the Italian State Railways and to propose a plan for a reformed administration. This commission contains all those who have been ministers of public works, representatives of the army, of commerce, agriculture and of labor—many of the most eminent men in Italy. Sacchi, the present minister, in an address at the first meeting of this commission, said that since 1902, the train mileage of the system had increased 48 per cent., the gross earnings 52 per cent., and the operating force 37 per cent., while the office force had increased 54 per cent. The commission will consider what will be the most advantageous grouping of the lines, the number of subordinate administrations and the extent of their independent authority. It is possible that a separate railway ministry will be proposed. Ministers change quite frequently in Italy.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Ouachita & Northwestern has ordered one locomotive from the Baldwin Locomotive Works.

The Toledo, Peoria & Western has ordered two consolidation locomotives from the Baldwin Locomotive Works.

The Chicago, Rock Island & Pacific, mentioned in the *Railway Age Gazette* of January 5 as being in the market for 45 mikado locomotives, have withdrawn its inquiries.

CAR BUILDING.

The Birmingham Southern has ordered 60 steel cars from the Standard Steel Car Company.

The Middle Tennessee has purchased two 60-ft. coaches from the Central Locomotive & Car Works.

The Norfolk & Western will build 500 hopper cars at the company shops on completion of the 500 cars now being built.

The Mobile & Ohio has ordered 200 steel underframe ventilated box cars from the Mt. Vernon Car Manufacturing Company.

The Birmingham & Northwestern has ordered fifty 35-ft. box cars of 60,000 lbs. capacity from the Central Locomotive & Car Works.

The Savannah Southern has ordered fifty 36-ft. flat cars of 60,000 lbs. capacity and fifteen 36-ft. box cars of 60,000 lbs. capacity from the Central Locomotive & Car Works.

The San Diego & Cuyamaca, mentined in the *Railway Age Gazette* of December 15, 1911, as in the market for passenger equipment, has ordered 1 coach, 1 combination passenger, baggage and mail car and 1 baggage car from the Central Locomotive & Car Works.

The Chicago, Rock Island & Pacific, in addition to the 20 steel baggage and mail cars, 10 steel passenger and baggage cars and 10 steel baggage cars mentioned in the *Railway Age Gazette* of February 2, are in the market for 6 steel dining cars and 2 gasolene electric motor cars.

The Pennsylvania System, mentioned in the *Railway Age Gazette* of February 9 as having ordered 200 passenger cars, has divided this order as follows: 65 suburban coaches and 10 combination passenger and baggage cars from the Pressed Steel Car Company; 75 suburban coaches from the American Car & Foundry Company; 15 suburban coaches and 35 combination passenger and baggage cars from the Standard Steel Car Company.

IRON AND STEEL.

The Lehigh Valley has ordered 10,000 rails from the Bethlehem Steel Company.

The Pittsburgh & Lake Erie has ordered 6,400 tons of rails from the Carnegie Steel Company.

The Northern Pacific has ordered 25,000 tons of open-hearth rails from the Maryland Steel Company.

The Atchison, Topeka & Santa Fe has ordered 5,000 tons of small bridge material from the American Bridge Company.

General Conditions in Steel.—During the past week there has been some price cutting by a few of the independent companies. The Steel corporation, however, has made no reductions. The Steel Corporation continues to operate at almost 90 per cent. of its capacity, and it is calculated that since January 1, 18 additional furnaces of that company were blown in. Orders booked during January averaged about 37,750 tons a day, as compared with almost 70,000 tons a day in December. The Steel Corporation is not very anxious to take new orders at current prices, as with its present unfilled orders it could operate its mills at the current percentages of capacity for four or five months. No price reductions by the larger steel companies are expected for a long time, if at all.

Supply Trade News.

Coleman B. Ross, formerly with the Linde Air Products Company, Buffalo, N. Y., has gone to the Independent Pneumatic Tool Company, Chicago, with office in Pittsburgh, Pa.

Edgar M. Smith, formerly for some years connected with the Q. & C. Company, New York, has returned to that company, and for the present will be located at its Chicago office.

The Crane Company, Chicago, has leased the northeast corner of Michigan boulevard and Eldredge place, 40 ft. x 160 ft., on which it will build a new office building of eight or ten stories.

Oscar R. Ford, general eastern manager of the Chicago Varnish Company, Chicago, with office in New York, died at his home in New York on February 8 at the age of 74. Mr. Ford was especially in charge of eastern railway business.

The Western Steel Car & Foundry Company, Chicago, has purchased the plant and property of the Illinois Car & Equipment Company, occupying about 100 acres at Hegewisch, Ill., for a stated consideration of $1,100,000. The company has occupied the property since 1902 under lease, and is now exercising its option to purchase.

Frank F. Coggin, for several years representative of the Chicago Car Heating Company in New England territory, who for the past six months has been connected with the Ward Equipment Company, New York, has returned to his former position with the Chicago Car Heating Company, with headquarters at 170 Broadway, New York.

Charles Haines Williams, of the Chicago Railway Equipment Company, Chicago, was elected third vice-president of the company at its recent annual meeting. Mr. Williams was educated in the public schools of Baltimore, Md., and at the Baltimore Polytechnic Institute, from which he graduated in 1893, and also took a special course in mechanical drawing and machine design at the Maryland Institute and several private courses in different branches of engineering. He spent four years as special apprentice in the Mount Clare shops of the Baltimore & Ohio, working in the machine and locomotive shops, the erecting shops and in the foundry, drawing room and test departments. He left the Baltimore & Ohio to become connected with the Chicago Railway Equipment Company as mechanical inspector, and has been with that company continuously since.

Charles Haines Williams.

The Industrial Works, Bay City, Mich., has moved into its new office building at the corner of Washington avenue and Eleventh street. The structure is 110 ft. x 95 ft. in dimensions and is constructed of reinforced concrete and brick. It is of two stories, the first containing the general offices and the second a drafting room and library. The company is also building a 60-ft. addition to its foundry.

H. F. Wardwell has resigned as superintendent of power and equipment of the Chicago & Western Indiana and the Belt Railway of Chicago to become assistant manager of the Central Locomotive & Car Works, with office at Chicago. Mr. Wardwell has had an extensive railway experience, and was formerly chief clerk to President F. A. Delano of the Wabash, and later chief clerk to President H. G. Hetzler of the Chicago & Western Indiana.

Plans are being made for a formal opening of the Permanent Manufacturers' Exhibit of Railway Supplies and Equipment in the Karpen building, 900 South Michigan boulevard, Chicago, during the week beginning March 16. Nearly 50,000 invitations will be sent out to railway and supply men, and admission tickets may be obtained from V. Courtright, secretary. The exhibit booths, occupying 36,000 sq. ft. of space, or the entire twelfth floor of the building, have been provided with furniture, including mahogany tables, desks and chairs and rugs and uniform signs, and several exhibits are already in place. A large assembly room and committee rooms, handsomely furnished, as well as a club room for the use of the exhibitors have been located on the eleventh floor. Invitations have been extended to a large number of railway associations to make use of the assembly and committee rooms free of charge for their meetings, and several organizations have the matter under consideration.

As announced last week, William V. Kelley has resigned as president of the American Steel Foundries, an office he has held since 1905, and has been elected chairman of the company, a newly-created position, with office at Chicago. Charles Miller retains the position of chairman of the board of directors. Robert P. Lamont, who has been first vice-president of the company also since 1905, was elected president in place of Mr. Kelley. Mr. Kelley's retirement as president was due to a desire to obtain relief from some of the responsibilities of active office in view of his extensive other interests. George H. Scott, second vice-president of the company, will be promoted to first vice-president, succeeding Mr. Lamont. R. H. Ripley, third vice-president, will be advanced to the second vice-presidency, and Warren J. Lynch, fourth vice-president, to the office of third vice-president. Mr. Kelley was born at Gratis, Ohio, February 13, 1861, received a high school and commercial education, and began his business career as clerk and bookkeeper in a hardware store at Springfield, Ohio, in 1883. From 1885 to 1888 he was sales agent of the Springfield Malleable Iron Company, and from 1888 to 1897 of the Charles Scott Spring Company, Philadelphia, Pa. In 1897 he organized the Simplex Railway Appliance Company, of which he became president and treasurer. In January, 1905, the stock of this company was sold to the American Steel Foundries, and in August Mr. Kelley was elected president of that company, holding the office until his recent election as chairman of the company. He is also a director of the Allis-Chalmers Company, the Continental and Commercial National Bank and the South Side Elevated Railroad, Chicago. Robert Patterson Lamont was born at Detroit, Mich., December 1, 1867, and graduated from the University of Michigan with the degrees of B. S. and C. E. in 1891. After

W. V. Kelley.

Robert P. Lamont.

leaving college he was employed at the World's Columbian Exposition in 1891 and 1892. From 1892 to 1897 he was secretary and engineer of Shailer & Schinglau, a contracting company. From 1897 to 1905 he was associated with Mr. Kelley as first vice-president and a director of the Simplex Railway Appliance Company, and in 1905, when Mr. Kelley became president, he was made first vice-president of the American Steel Foundries, with office at Chicago.

TRADE PUBLICATIONS.

Railway Supplies.—The M. Mitshkun Company, Detroit, Mich., has published catalog D of its large variety of new and second-hand railway equipment and supplies. The catalog is illustrated and gives net prices.

Norfolk Southern.—The passenger department of this company has published a small folder entitled Winter Homes in the Virginia-Carolina Coast Country. The attractive features of this region are briefly set forth, and illustrations of choice bits of scenery are given. A map and a list of hotels and boarding houses, with their respective rates, are included.

Turbo-Generator Sets.—The General Electric Company, Schenectady, N. Y., has published bulletin No. 4887 on Small Turbo-Generator Sets in capacities of from 5 to 300 k.w. All of these sets are of the horizontal type and can be arranged to operate either condensing or non-condensing and at any steam pressure above 80 lbs. for the smaller sizes and 100 lbs. for the larger.

Southern Railway.—The land and industrial department of this company has published a small illustrated booklet entitled Southern Georgia and Northern Florida, telling of the advantages, possibilities and climatic conditions in this region. Each county is discussed separately. A brief description of the soil is given, and the many and varied products are enumerated in an attractive manner. Manufactures, education and land values are also touched upon.

Concrete Reinforcement.—The Corrugated Bar Company, Buffalo, N. Y., has published four carefully prepared booklets entitled Useful Data on Corr Products, Corr-Mesh, Corr-Plate Floors, and Corr Tile Floor Construction. These booklets give descriptions, diagrams, tables, results of tests, and specifications. These products are used for the reinforcement of concrete for buildings, conduits, tanks, fences, etc. A number of illustrations of buildings in which these products have been installed are included.

FOREIGN RAILWAY NOTES.

The Western Buenos Aires Railway has been authorized by the Argentine congress to build a branch railway from kilometer 56½, of the La Zanja branch, to Gonzalez Moreno, in the Pampa territory.

The Germans have now completed a railway line in the interior of their southwest African colony nearly its entire length from north to south, from about latitude 19 deg. to latitude 28 deg. south, generally 150 miles or so from the coast, to which it has outlets at Luderitz Bay in latitude 26 deg. 30 sec., and at Whale Bay, 275 miles further north. The northern section carries considerable ore to Whale Bay.

The Australian parliament has authorized the construction of about a thousand miles of railway, which will complete a connection between the east and west coasts. By far the larger part of the population, and nearly all the fertile land is in the east coast colonies, extending also along the south coast some hundreds of miles. West, Australia, however, has valuable mines and has been growing rapidly. From its chief port, Perth, which is more than 150 miles north of what may be called the southwest corner of Australia, a narrow-gage railway has been built eastward 380 miles to the mining region about Kalgoorlie. Thence there is a gap of about a thousand miles before reaching Port Augusta, at the head of a bay in South Australia, from which lines extend, or may be made to extend by building not very long sections of railway, to all the chief ports—Melbourne on the south coast and Sidney and Brisbane on the east coast. The line between Kalgoorlie and Port Augusta runs through desert country, not very far from the south coast.

Railway Construction.

New Incorporations, Surveys, Etc.

Anderson & Saline River.—This company has under consideration the question of building a line, it is said, from Pine Bluff, Ark., west to Leola, about 40 miles. J. S. Bell, chief engineer, Pine Bluff.

Atlantic Coast Line.—According to press reports this company will build two connecting lines in west Florida. One is to be built from Dunnellon, northwest, to Old Town, about 42 miles, and the other between Perry and Monticello, 32 miles. E. B. Pleasants, chief engineer, Wilmington, N. C.

Arkansas Roads.—A company is being organized, and expects to begin work during February on a 25-mile line from Little Rock, Ark. C. C. Godman, Fort Smith, Ark., may be addressed.

Plans are being made, it is said, to build from Marianna, Ark., west via Moro, to Brinkley, about 25 miles. F. S. Yants, Paragould, may be addressed.

Bagoteville & St. Lawrence.—This company, which has a capital of $2,000,000, it is understood will build from St. Alphonse, Que., or Grande Baie, to Murray Bay. Preliminary surveys have already been made. H. Patton, Albany, N. Y.; G. Tanquay, Quebec; A. Lepage, Bagoteville, and J. Tremblay, Ste. Anne, are interested.

Cairo, Trumann & Southern.—Incorporated in Arkansas, to build from Trumann, Poinsett county, Ark., south to Earl, Crittenden county, 29 miles. V. W. Krafft, St. Louis, Mo., may be addressed.

Canadian Pacific.—The Dominion Railway Commission has approved the plans submitted by the Esquimalt & Nanaimo for the extension up the east coast of Vancouver Island from Union Bay to Duncan Bay. Grading work has already been started. H. J. Cambie, chief engineer, Victoria, B. C.

Surveys have been made, it is said, for double tracking work between Spences Bridge, B. C., and Hope, about 100 miles. J. G. Sullivan, chief engineer, Winnipeg, Man.

Central of Canada.—It is understood that construction work is to be started early this spring on a line from Montreal, Que., to Ottawa. It is said that double track will be laid from Montreal to St. Eustache, and that there will be three bridges, one at Back river, another at St. Eustache, and the third at St. Andrews. C. H. Wills & Sons, London, are the contractors. David Lyell is their representative at Montreal.

Clarksburg & Philippi Traction Company.—Incorporated in West Virginia, with $300,000 capital, to build from Clarksburg, W. Va., southeast via Philippi to a point near Belington, about 35 miles, with a branch south to Buckhannon, about 20 miles. The incorporators include T. L. Nutter, Clarksburg; J. C. Watson and R. J. Dunham, Philippi, and C. Robb, Fairmont.

Clinton & Oklahoma Western.—This company, which operates a 21½-mile line from Clinton, Okla., to Butler, has given a contract, it is said, to Maney Brothers, Oklahoma City, to build a 30-mile extension from Butler westerly up the Washita valley to a point near the center of Roger Mills county. The contract includes grading, the construction of 3,000 linear feet of bridge work, and putting up four new stations. Guy V. McClure, chief engineer, Clinton, Okla.

Crystal City & Uvalde.—See Mexico, San Antonio & Gulf.

Eastern Shore Power, Light & Railway Company.—This company is making plans, it is said, to build from Deal Island, Md., east via Princess Anne to Sinepuxent Bay, about 50 miles, also to build branch lines. The company has a capital of $500,000, and the incorporators include H. J. Waters, J. M. West, J. S. Noel and H. Riggin.

Esquimalt & Nanaimo.—See Canadian Pacific.

Fairmont & Clarksburg Traction Company.—According to press reports, this company is planning to build a line to connect Fairmont, W. Va., and Weston. S. B. Miller, chief engineer, Fairmont, W. Va.

Glenmora & Western.—An officer of this company, which was recently incorporated to build from Glenmora, La., north-

west to Shreveport, also from Glenmora southeast, writes that work is now under way and track has been laid on about three miles. The company is carrying out the work at present with its own men. N. M. Cady, McNary, may be addressed. (February 2, p. 221.)

GRAND TRUNK.—Bids are being asked for, it is said, to build the Southern New England from Palmer, Mass., to tidewater at Providence, R. I. The work must be finished before December, 1913. H. R. Safford, chief engineer, Montreal, Que. (Aug. 18, p. 357.)

Articles of incorporation of the Southern New England to build a Grand Trunk extension, were filed in New Hampshire recently. The plans call for a line from Lebanon, N. H., through from Vermont at Lebanon, Grafton, Sullivan and Merrimac counties to Concord, thence down the Merrimac river to the New Hampshire-Massachusetts state line.

GRAND TRUNK PACIFIC.—This company is planning to build a branch, it is said, from Napadoggan, the first divisional point west of Moncton, N. B., to Fredericton, 45 miles, to provide a more direct route to tidewater at St. John, N. B., through a connection with the St. John Valley. B. B. Kelliher, chief engineer, Winnipeg, Man.

GREAT NORTHERN.—An officer writes that revision work is now being carried out on about six miles between Sandpoint, Ida., and the Washington-Idaho line. A. H. Hogeland, chief engineer, St. Paul, Minn.

INTERNATIONAL & GREAT NORTHERN.—Surveys are now being made, it is said, for an extension from Laredo, Tex., down the valley of the Rio Grande, to a connection with the Harlingen branch of the St. Louis, Brownsville & Mexico at Sam Fordyce, about 125 miles.

LAKE ERIE & NORTHERN (Electric).—An officer writes that contracts will be let about May 1, to build from Brantford, Ont., south via Waterford and Simcoe to Port Dover on Lake Erie. The work involves handling about 17,000 cu. yds. a mile. The maximum grade will be 1.25 per cent., and the maximum curvature 4 deg. There will be a 450 ft. steel bridge, and another steel bridge of 438 ft., also a 1,200 ft. timber trestle. John Muir, president, William P. Kellett, chief engineer, Brantford. (February 2, p. 221.)

LOUISVILLE & NASHVILLE.—According to press reports, a contract has been given to the Leighton-Ambrose Construction Company, Knoxville, Tenn., for grading work on seven miles south of Lewisburg, Ala. Half of this work will be through rock. W. H. Courtenay, chief engineer, Louisville, Ky. (June 16, p. 1447.)

Contracts for double tracking work from Black Creek, Ala., to Cullman, 46 miles, it is said, have been given to the following contractors: The Asheville Construction Company, 10 miles; the Calahan Construction Company, six miles; Thrasther & Gunther, eight miles; Adams & Solomon, five miles, and J. C. Garland & Co., 17 miles. The work north of Cullman, and from that place to Decatur, and from Decatur north to Lewisburg has already been let. W. H. Courtenay, chief engineer, Louisville, Ky.

MAHONING & SCHENANGO RAILWAY & LIGHT COMPANY.—It is understood that definite steps are now being taken to build the proposed connections to complete a through route over electric lines from Cleveland, Ohio, to Pittsburgh, Pa. M. E. McCaskey, vice-president and general managers, Youngstown.

MEXICO & NORTH WESTERN.—The new line from Madera, Mex., north to Pearson, 103 miles, is to be opened for business on February 20. This completes the through connection from El Paso, Tex., south to Chihuahua. F. S. Pearson, president, New York, N. Y.

MEXICAN ROADS.—Surveys have been made to build a railway from the City of Mexico, Mex., to the summit of Popocatepetl, which is 17,500 ft. above the sea level. Dr. F. S. Pearson, president of the Mexico North Western, and associates are back of the project.

MEXICO, SAN ANTONIO & GULF.—Work has been started at San Antonio, Tex., on this line. The plans call for building from San Antonio to a point in the Rio Grande valley, about 260 miles, with a number of branch lines. The company will take over the rights and property, it is said, of the Crystal City & Uvalde, which now operates about 80 miles. J. E. Franklin, president of the Bankers' Trust Company, St. Louis, Mo., is back of the project.

NAVAJO SOUTHERN.—A company is to be organized under this name with $3,500,000 capital to build from Holbrook, Ariz., on the Santa Fe Coast Lines south to Snowflake, about 30 miles, thence via Pinetop, northeast, to St. Johns, about 40 miles. It is estimated that it will cost about $1,000,000 to build the line. F. H. Bowen, president; W. H. Clark, secretary; R. W. Hill, treasurer, and E. S. Clark, counsel, Prescott.

NEW ORLEANS, NATALBANY & NATCHEZ.—This road has been extended from Pine Grove, La., to Grangeville, six miles. F. C. Denkman, president, Rock Island, Ill.

NORTHWESTERN PACIFIC.—An officer writes that work is now under way by the Utah Construction Company, Ogden, Utah, on the connecting link between Willits, Cal., and Eureka. The company let a contract early in January for seven miles, and expects to let contracts for 40 miles additional to complete the line within four or five months. It is expected that all the work will be finished during 1913. The work is very heavy. F. T. Vanatta, chief engineer, Sausalito, Cal.

NORTHERN PACIFIC.—A contract has been given to Porter Brothers, Portland, Ore., it is said, for double tracking work from Tacoma, Wash., southwest to Tenino, 30 miles. W. L. Darling, chief engineer, St. Paul, Minn.

OHIO & KENTUCKY.—This road has been extended from Liberty Road, Ky., to Licking River, three miles. G. Thompson, chief engineer, Springfield, Ohio.

OKLAHOMA & GOLDEN CITY.—Surveys have been made, it is said, from Jefferson City, Mo., to Fairview, Okla., 385 miles. It is understood that the work will be started soon by William Love, Lafayette, Ind. C. E. Hagerty, New York; A. S. Vaughn, Boliver, Mo.; M. H. Cooper, Pittsburgh; D. E. Ketcham, Golden City, Mo., and E. C. Griesel, Muskogee, Okla., are interested.

PECOS VALLEY SOUTHERN.—According to press reports, this company is planning to build an extension from Pecos, Tex., northwest to Lamesa, about 130 miles. L. M. Schwab, assistant superintendent and division engineer, Pecos, Tex.

RIO GRANDE & EAGLE PASS.—This company, which operates a line from Laredo, Tex., to Minera, 29 miles, it is said, will build an extension from Laredo south along the Rio Grande. R. W. Davis, chief engineer, Laredo.

ST. JOHN VALLEY.—This company, it is said, will ask for bids during February for work on the line projected from St. John, N. B., northwest to Grand Falls, 208 miles. The Victoria Construction Company, Ltd., has asked for incorporation to bid for work on this line. A. R. Gould, president, St. John Valley. (December 29, p. 1356.)

SAN JOSE & ALMADEN (Electric).—An officer writes that this company will build a line from San Jose, Cal., south to Almaden, 12 miles. The maximum grade will be 10 per cent. There will be two steel and concrete bridges, each 50 ft. long. All the work except the bridge work is to be done by day's labor. D. B. Burnett, attorney, Safe Deposit building, San Jose, Cal.

SOUTHERN NEW ENGLAND.—See Grand Trunk.

SOUTHWESTERN TRACTION & POWER COMPANY.—An officer writes that contracts are let, and work is to be started at once on a line from New Iberia, La., southeast along the banks of the Bayou Teche, to Jeanerette, about 15 miles. A. F. Jacobs, president, L. Blum, treasurer. The directors include J. Godchaux and A. G. Barrows, New Orleans.

SPRINGFIELD & CENTRAL ILLINOIS TRACTION.—An officer writes that this company is planning to build from East St. Louis, Ill., east to Oskaloosa, about 80 miles. The route has been approved by the financial backers. It is undecided when contracts will be let for the work. Isaac A. Smith, president, St. Louis, and the East St. Louis Engineering Company are the engineers.

UTAH ROADS (Electric).—Plans are being made to organize a company to build from a connection with the Salt Lake & Ogden, at Salt Lake City, Utah, south to Nephi, about 90 miles. George Whitmore, Nephi, is to be president of the company.

RAILWAY STRUCTURES.

Abiline, Tex.—The Abilene & Southern will rebuild a roundhouse and machine shops 32 ft. x 138 ft., which were destroyed by fire.

Artesia, N. M.—The Atchison, Topeka & Santa Fe is building a new brick passenger station to cost about $15,000.

Baltimore, Md.—An officer of the Pennsylvania Railroad writes that bids have been asked for up to March 1, for putting up concrete bridges over the Back river, over Gunpowder river, and over Bush river, on the line between Baltimore, Md., and the Susquehanna river.

Butte, Mont.—The Great Northern, it is reported, will begin work in the spring on the construction of a new passenger station to cost $125,000.

Butler, Okla.—See Clinton & Oklahoma, Western under Railway Construction.

Calgary, Alb.—Westinghouse, Church, Kerr & Company, New York, have been retained by the Canadian Pacific as engineers and constructors for the shops and additions at Calgary. The work includes the design and building of shops, comprising locomotive erecting shop, machine shop, blacksmith shop, boiler shop, tender shop, foundry, planing mill, power house, pattern shop, coach repair and paint shop, freight car repair shop, storeroom and office building, oil house and numerous smaller buildings and structures, such as mess building, dry kiln, scrap docks and material bins. The erecting shop will be of the transverse lift-over type, and will contain 35 bays. The machine shop for heavy machine tools will be placed parallel to and adjoining the erecting shop on one side, and space will be provided alongside of this shop for another machine shop to contain lighter tools. The blacksmith shop will be parallel to and adjoining the erecting shop, on the opposite side to the machine shop. Adjoining the end of the blacksmith shop, and parallel to the erecting shop will be the boiler shop next to the high bay of which space is provided for flue shop, boiler shop tools and a flue rattler. In general the construction will be concrete steel brick or hollow tile, depending on conditions. The work will also include the design and installation. J. G. Sullivan, chief engineer western lines of the Canadian Pacific, is in charge.

Clarendon, Ark.—The St. Louis Southwestern has given a contract to the Wisconsin Bridge & Iron Company for a drawbridge requiring 700 tons of steel shapes.

Ft. William, Ont.—The Grand Trunk Pacific will enlarge its Ft. William elevators to bring the total capacity up to 6,000,000 bushels.

Garrett, Ind.—The Baltimore & Ohio has purchased land near Garrett on which to build new shops.

Helena, Mont.—The Great Northern, it is reported, will begin work in the spring on the construction of a new passenger station to cost $125,000.

Hillsboro, Tex.—The roundhouse of the Missouri, Kansas & Texas was destroyed by fire on February 10.

Paducah, Ky.—Negotiations have been in progress for some time between the Chicago, Burlington & Quincy, Illinois Central, Chicago & Eastern Illinois and Louisville & Nashville, for the construction of a double-track bridge across the Ohio river, 12 miles from Paducah. It is understood that the contract will be let shortly.

Pine Bluff, Ark.—The St. Louis Southwestern will erect a boiler and machine shop, 124 ft. x 320 ft., to replace the building burned on January 1.

Port Arthur, Ont.—The Canadian Northern will erect a dock to cost about $40,000.

St. Louis, Mo.—The Chicago, Burlington & Quincy has begun work on the erection of a new freight terminal.

San Diego, Cal.—The Atchison, Topeka & Santa Fe has plans for a large new freight house at this point, but its construction has not yet been authorized.

Winnipeg, Man.—The Canadian Northern will build a new yard about three miles east of the city.

Railway Financial News.

Atchison, Topeka & Santa Fe.—This company has filed an application with the Kansas railway commission for authority to issue $18,000,000 4½ per cent. 50-year bonds, secured by a mortgage on the California, Arizona & Santa Fe. This is the road which was recently incorporated in California with a capital stock of $50,000,000 and includes the lines from Needles, Cal., to Mojave, which the Atchison recently purchased from the Southern Pacific. It is part of the Atchison main line and before its acquisition was leased from the Southern Pacific for a long term. Company also includes other lines in California and Arizona.

The bonds will probably not be offered to Atchison security holders but will be sold to bankers. J. P. Morgan & Co. have always done Atchison's financing.

Boston & Albany.—The directors have approved an issue of $1,000,000 bonds, which presumably are not to be issued at once. Funds still in hand are understood to be ample to pay for all construction work up to January 1, 1913. The expenditures planned for the 1912 calendar year are about $1,465,000.

Chesapeake & Ohio.—See an article in regard to this company in Court News.

Chicago, St. Paul, Minneapolis & Omaha.—As mentioned in these columns last week, the directors authorized the immediate sale of $5,000,000 5 per cent debenture bonds, which were taken by Kuhn, Loeb & Co., New York. At the same time they authorized $10,000,000 additional debenture bonds to be issued after obtaining the permission of the railway commission of Wisconsin. Of the proceeds of the $5,000,000 sold, $3,700,000 is to be used for building and equipping 60 miles of double track between Eau Claire, Wisconsin, and Hudson.

Denver & Rio Grande.—E. L. Brown, vice-president, has been elected a director, succeeding Howard Gould, resigned.

Detroit, Toledo & Ironton.—*The Wall Street Journal* says that while definite plans for the reorganization have not been completed, tentative plans probably call for a new prior lien mortgage and an issue of short term 5 per cent. bonds to amount to about $15,000,000.

Grand Trunk.—The Massachusetts railway commission has approved the estimates of the Southern New England (the subsidiary of the Grand Trunk which is to build a line to Providence, R. I.) for its road through Hampdon and Worcester counties.

Grand Trunk Pacific—The judicial committee of the privy council of Canada has overruled the Supreme Court and has held that the Canadian government must pay the difference between the selling price of the 3 per cent. guaranteed bonds of the Grand Trunk Pacific and par. The decision has been accepted both by the government and railway company, and the legislature will be asked to appropriate the necessary amount of money.

St. Louis Southwestern.—The directors have authorized an issue of $100,000,000 first terminal and unifying 5 per cent. bonds of January 1, 1912-1952. Of this authorized issue, $7,500,000 have been sold to the Guaranty Trust Company, Rhoades & Co., and William Salomon & Co., all of New York. Of the proceeds of the bonds now sold, $2,100,000 will be used to retire about $2,100,000 equipment obligations and other immediate requirements, and the remainder for terminal facilities at St. Louis and elsewhere. A special meeting of stockholders is called for April 17 to ratify the action of the directors.

Southern Pacific.—A press despatch from San Francisco says that suit has been filed by the Southern Pacific against J. D. and A. B. Spreckels for about $3,220,000 advanced by the Southern Pacific for the building of the San Diego & Arizona.

Southern Railway.—The directors have declared a semi-annual dividend of 2 per cent. on the preferred stock. This places the preferred on a 4 per cent. annual basis as compared to a 2 per cent. annual, the rate in 1911. During the first six months of the fiscal year ending June 30, 1912, the Southern Railway earned apparently 7 per cent. on its $60,000,000 preferred stock.